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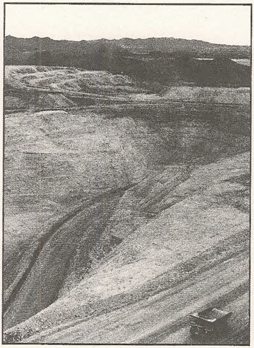
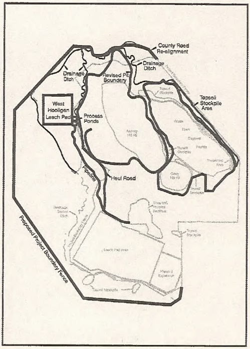
Environmental Impact Statement
Denton-Rawhide Mine Expansion Project





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MISSION STATEMENT

The Bureau of Land Management is responsible for the stewardship of our public lands. It is committed to manage, protect, and improve these lands in a manner to serve the needs of the American people for all times. Management is based upon the principles of multiple use and sustained yield of our nation's resources within a framework of environmental responsibility and scientific technology. These resources include recreation, rangelands, timber, minerals, watershed, fish and wildlife, wilderness, air and scenic, scientific and cultural values.

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United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Carson City District Office
1535 Hot Springs Road
Carson City, Nevada 89706-0638
PH:(702) 885-6100

November 1, 1996

IN REPLY REFER TO:
3809 (NV030)
N36-86-003P

Dear Reader:

Enclosed for your review and comment is the Draft Environmental Impact Statement (EIS) for Kennecott Rawhide Mining Company's Denton-Rawhide Mine Expansion Project prepared by the Bureau of Land Management (BLM) Carson City District Office.

The Draft EIS is based on the plan of operations submitted to the BLM under 43 Code of Federal Regulations 3809. This Draft EIS analyzes the direct, indirect, and cumulative impacts associated with the expansion of the existing pits, waste dumps, and heap leach pads at the Denton-Rawhide Mine. The plan of operations and technical reports in support of the plan are available for review at the BLM office in Carson City, Nevada.

The BLM is interested in your review and comment on the adequacy and accuracy of this document. Public comments will be accepted during a 60-day comment period. Written comments on the Draft EIS must be postmarked by January 3, 1997, and should be sent to:

Bureau of Land Management
Carson City District Office
Attn: Terri Knutson, EIS Project Manager
1535 Hot Springs Road
Carson City, NV 89706

In addition, a public open house to accept comments is scheduled for November 20, 1996, from 4:00 to 6:00 p.m., at the Bureau of Land Management office in Carson City, NV (address above).

A Final EIS will be prepared that will consider the comments received after the public review and comment period. The Final EIS may be in an abbreviated format; therefore you should retain this Draft EIS as a reference. For additional information, please contact Terri Knutson at the address listed above or at (702) 885-6156.

Sincerely,

Karl L. Kipping

John O. Singlaub
Associate District Manager

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ENVIRONMENTAL IMPACT STATEMENT
KENNECOTT RAWHIDE MINING COMPANY
DENTON-RAWHIDE MINE EXPANSION PROJECT

LEAD AGENCY: U.S. Department of the Interior
Bureau of Land Management
Carson City District Office

PROJECT LOCATION: Mineral County, Nevada

COMMENTS ON THIS DRAFT (EIS) SHOULD BE DIRECTED TO:
Terri Knutson, EIS Project Manager
Bureau of Land Management
Carson City District Office
1535 Hot Springs Road
Carson City, NV 89706
(702) 885-6000

DATE DRAFT EIS FILED WITH EPA: November 1, 1996

DATE WHEN COMMENTS MUST BE POSTMARKED TO THE BLM: January 3, 1997

ABSTRACT

The Draft Environmental Impact Statement analyzes impacts associated with a proposed expansion of the Denton-Rawhide Mine located in Mineral County, Nevada. The Proposed Action includes: (1) expansion of the Murray Hill pit, (2) expansion of the waste rock disposal facility, (3) construction and operation of a run-of-mine leach pad, (4) relocation of a run-on-control diversion ditch, and (5) reclamation of disturbed areas. Alternatives to the Proposed Action, including the No Action Alternative, are analyzed in the document. The Agency Preferred Alternative is implementation of Alternative A (partial backfilling of the Murray Hill pit).

Responsible Official for EIS:

John O. Singlaub
District Manager
Carson City District

DRAFT ENVIRONMENTAL IMPACT STATEMENT
DENTON-RAWHIDE MINE EXPANSION PROJECT

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SUMMARY

Kennecott Rawhide Mining Company (KRMC) proposes to expand mining operations at its Denton-Rawhide Mine located in Mineral County, Nevada; approximately 55 miles south of Fallon, Nevada. KRMC began mining operations at the Denton-Rawhide Mine in 1989. Mining and ore processing operations associated with the mine expansion are described in an amended Plan of Operations (POO) submitted to BLM in August 1995. BLM reviewed the POO and determined that the proposed mine expansion (Proposed Action) has the potential to result in significant environmental effects and that preparation of an Environmental Impact Statement (EIS) would be required.

This EIS describes KRMC's Proposed Action, reasonable alternatives to, and environmental consequences of implementing the mine expansion project and/or alternatives. Potential direct, indirect, and cumulative effects of the project on the human environment have been analyzed for the proposed mine expansion. Alternatives to the Proposed Action were developed and were analyzed for potential direct and indirect impacts. This evaluation has been completed to the extent necessary to determine whether potential impacts are significant. Impacts described in this EIS will form the basis for BLM's decision regarding the Proposed Action and alternatives and selection of mitigation measures. Impacts described in this EIS apply to both public and private land.

SUMMARY OF PROPOSED ACTION

KRMC's Proposed Action would result in expansion of the Murray Hill pit, expansion to the Waste Rock Disposal Facility, construction and operation of a run-of-mine (ROM) leach pad facility, and relocation of a run-on control diversion ditch. Existing mine facilities would continue to be used for processing leach ore and solutions. The expansion would add approximately 5 years to the active mine life for the Denton-Rawhide Mine.

Additional land disturbance associated with the Proposed Action would be approximately 364 acres. If the Proposed Action were implemented, the total land area disturbed by mining activities would be 1,369 acres. With the addition of 5 years of active mining at the Denton-Rawhide Mine, mine closure would occur in year 2016 with completion of reclamation.

Expanded mining in the Murray Hill pit would result in the recovery of crusher grade ore and run-of-mine (ROM) leach grade ore. Crusher grade ore would be processed at existing crushing and leach facilities. ROM ore would be processed on a newly constructed leach pad. Approximately 18.5 million tons of crusher grade ore and 14 million tons of ROM ore would be produced from expanded mining operations.

Approximately 36.7 million tons of waste rock would be excavated and disposed of at the waste rock disposal facility for the Proposed Action. Based on tests completed on waste rock associated with existing mining operations and the geology of the ore deposit, the majority of waste rock to be produced in the expanded Murray Hill pit is expected to be non-acid producing.

Expansion to the Murray Hill pit would not require the use of dewatering systems. Groundwater in the mine pit area would not be encountered by pit development.

Proposed reclamation for the Denton-Rawhide Mine would include regrading, scarification, placement of a minimum of 6 inches of alluvium/growth medium, and revegetation. Slopes on leach pads and waste rock disposal sites would not exceed 2.5 horizontal (H):1 vertical (V). Safety berms and signing would be installed around the rim of the open pit.

PROJECT ALTERNATIVES

Issues raised during public scoping and BLM review of the amended POO were used to identify potentially significant impacts which could result from expansion of the Denton-Rawhide Mine project. As a result, two alternatives were identified for detailed consideration in this EIS: (1) Alternative A -- Partial Backfilling of the Murray Hill Pit; and (2) the No Action Alternative.

Alternative A -- Partial Backfilling of the Murray Hill Pit: Alternative A would include all components of the Proposed Action and would require KRMC to modify its project schedule to backfill southern and northern portions of the Murray Hill pit. Implementation of this alternative would result in the placement of 440,000 tons of waste rock in the northern portion of the pit and approximately 4 million tons of waste rock in the southern portion of the pit.

Backfilling these portions of the pit would restore approximately 35 acres of land surface to productive use after cessation of mining operations. Backfilled areas would be reclaimed in accordance with KRMC's approved reclamation plan for the Denton-Rawhide Mine.

No Action Alternative: Under the No Action Alternative, BLM would not authorize the proposed Plan of Operations; therefore, further disturbance to federal land would not occur.

Agency Preferred Alternative: The Agency Preferred Alternative is Alternative A -- partial backfilling of the Murray Hill pit.

SUMMARY OF IMPACTS

Detailed analysis of potential impacts and mitigation measures associated with the Proposed Action are presented in Chapter 4 -- Consequences of the Proposed Action and Alternatives. Resources analyzed in this EIS which are determined to be minimally impacted as a result of the Proposed Action and alternatives include: cultural resources and paleontology, range resources, recreation, land use and access, social and economic resources, and water quantity and quality.

PROPOSED ACTION

Geology and Minerals

The Proposed Action would result in relocation of waste rock and ore from the Murray Hill pit to waste rock disposal facilities and heap leach pads. Placement of rock materials in these locations would modify the landscape and topography of the project area.

Potentially acid-producing rock to be excavated from the Murray Hill pit represents less than 8 percent of the total rock to be removed. As such, surrounding potentially acid-producing rock with nonacid-producing waste rock would neutralize any acidic leachate which may form in waste rock or ore piles.

Air Resources

Particulate and gaseous emissions would continue at present levels at the Denton-Rawhide Mine. The period of time for these emission sources would expand as a result of expanded mining. All emissions would remain within existing permit requirements.

Soil Resources

Soil resources in the mine area are limited. KRMC has salvaged and would continue to salvage alluvium/growth medium for use as soil material during reclamation. KRMC would respread salvage growth medium to a minimum depth of 6 inches on all reclaimed surfaces except for the Murray Hill open pit.

Vegetation

The Proposed Action would eliminate vegetative cover on approximately 364 additional acres at the Denton-Rawhide Mine. Reclamation activities would restore vegetation on approximately 164 acres. The Murray Hill pit would not be revegetated.

Wildlife and Fisheries Resources

Direct loss of habitat as a result of the Proposed Action would eliminate forage, hiding cover, breeding sites, nesting cover, and thermal cover for wildlife species. Species dependent on this habitat would die or be displaced to undisturbed, adjacent habitat. Species most likely to be affected include chukar, passerine birds, small mammals, and reptiles.

The Proposed Action would result in the destruction of the Hooligan adit which has been used for roosting, hibernating, and possibly rearing of young by California myotis or small-footed myotis, Townsend's big-eared bats, and pallid bats.

Threatened, Endangered, Candidate, and BLM Sensitive Species

No threatenend, endangered, or candidate species are known to inhabit the Denton-Rawhide Mine area. Thirteen BLM sensitive animal species (formerly U.S. Fish and Wildlife Service candidate species) may occur in the project area. Two of these species, pale Townsend's big-eared bat and long legged myotis, were observed during field surveys or suitable habitat may be present in the project area.

The Proposed Action would result in destroying the Hooligan mine adit which is used for roosting and hibernation by BLM sensitive bat species.

Aesthetics (Visual Resources and Noise)

The primary impact to visual resources resulting from the Proposed Action would be large-scale modification of landforms at the Denton-Rawhide Mine project area. Enlargement of angular, blocky forms, and horizontal lines of existing facilities would create weak contrasts with the natural landscape. Land clearing and construction would expose soil and rock material in a variety of colors ranging from light gray to reddish tan to very dark gray. Some change in texture would be evident between cleared areas and natural, undisturbed adjacent sites. Overall contrast is expected to be weak.

ALTERNATIVES

Where specific impacts, by resource, are not presented under each alternative, impacts to those resources are predicted to be the same as those previously described for the Proposed Action.

ALTERNATIVE A

Geology and Minerals

Partial backfill of the Murray Hill pit would likely limit further mining or possible ore reserves in the backfilled portions of the pit.

Air Resources

Ambient air standards are not expected to be exceeded by backfilling the Murray Hill pit. The volume of material to be handled during backfilling would not differ from the volume to be handled under the Proposed Action.

Soil Resources

Approximately 35 acres of land surface would be restored for productive use by partially backfilling the Murray Hill pit. This additional land surface would not significantly reduce the depth of redistributed growth medium available for the remaining project area.

Vegetation

Partial backfilling of the Murray Hill pit would restore approximately 35 acres of land for productive use after cessation of mining operations. This land surface would be revegetated in accordance with KRMC's reclamation plan for the Denton-Rawhide Mine.

Wildlife and Fisheries Resources

Partial backfilling of the Murray Hill pit would potentially restore approximately 35 acres of habitat for wildlife - principally reptiles, small mammals, and songbirds. Backfilling portions of the pit may also result in the loss of potential raptor nesting sites associated with the pit highwalls in these areas of the pit.

Threatened, Endangered, Candidate, and BLM Sensitive Species

Implementation of Alternative A would not likely result in significant impacts to Nevada BLM-sensitive species.

Aesthetics (Visual Resources and Noise)

Partial backfilling of the Murray Hill pit would result in a slight reduction in visual impacts as viewed from the Key Observation Point (KOP).

NO ACTION ALTERNATIVE

Under the No Action Alternative, the proposed Plan of Operations and subsequent disturbance of public land would not occur.

AGENCY PREFERRED ALTERNATIVE

The agency preferred alternative is Alternative A. Alternative A would result in restoration of an additional 35 acres of land surface to productive use as compared to the Proposed Action.

CHAPTER 1

INTRODUCTION

The Carson City District of the Bureau of Land Management (BLM) received an amended Plan of Operations N36-86-003P (95-02A) from Kennecott Rawhide Mining Company (KRMC) in September of 1995 proposing expansion of mining activities at the Denton-Rawhide Mine located in Mineral County, Nevada. The mine site is located on public and private lands in Mineral County, approximately 55 miles southeast of Fallon, Nevada (**Figure 1-1**). KRMC's proposed expansion of the Denton-Rawhide Mine would involve public lands administered by BLM; therefore, review and approval of KRMC's amended Plan of Operations is required by BLM pursuant to Title 43, Code of Federal Regulations, Part 3809 (43 CFR 3809) Surface Management Regulations.

BLM is the lead agency in preparing this Environmental Impact Statement (EIS) for the proposed project. This document follows the president's Council on Environmental Quality (CEQ) regulations for the National Environmental Policy Act (NEPA; 40 CFR 1500-1508) and BLM's (1988) NEPA Handbook (H-1790-1). Those regulations are emphasized in the Carson City District's NEPA policy: *"Clarity of expression, logical thought processes and rational explanations are far more important than length or format in the discussion of impacts. Subjective terms will be avoided. The analysis will lead to pointed conclusions about the amount and degree of change (impact) caused by the proposed action and alternatives. Descriptions of the affected environment will be no longer than is absolutely necessary to understand the impacts of the alternatives. The length of the EIS will be kept to a minimum by incorporating materials by reference. The EIS will concentrate on the issues that are truly significant to the action in question, rather than amassing needless detail. The EIS will be written in plain language. The EIS writer will reduce paperwork and the accumulation of extraneous background data and emphasize real environmental issues and alternatives. The EIS will be concise, clear, and to the point, and shall be supported by evidence that agencies have made the necessary environmental analyses."*

This EIS describes the components of, reasonable alternatives to, and environmental consequences of expanded mining and ore-processing operations at the Denton-Rawhide Mine. Chapter 1 describes the purpose and need of the project expansion, the role of BLM, and public participation in the EIS process. Chapter 2 describes the history of mining in the project area, a description of existing mining operations and the proposed expansion (Proposed Action), and alternatives to the Proposed Action. Chapter 3 provides a description of the existing environment in the project area. Chapter 4 identifies the potential direct, indirect, and cumulative impacts associated with the Proposed Action and alternatives. Potential mitigation measures which would reduce or minimize impacts are also described in Chapter 4. Chapter 5 lists federal and state agencies which were consulted during preparation of the EIS and provides a list of preparers. Chapter 6 is a list of references cited, glossary of terms, and list of acronyms used in the EIS.

PURPOSE AND NEED

The purpose of KRMC's proposal is to use the existing work force at the Denton-Rawhide Mine to expand open-pit mining activities and ore-processing operations to recover gold from ore reserves contained in the mine area. Gold is an established commodity with international markets. Uses include jewelry, investments, standard for monetary systems, electronics, and other industrial applications.

AUTHORIZING ACTIONS

Proposals submitted to BLM may be approved after environmental analysis is completed. BLM decision options include approving KRMC's amended Plan of Operations, approving alternatives to the amended Plan of Operations which mitigate environmental impacts, and approving the amended Plan of Operations with conditions to mitigate environmental effects.

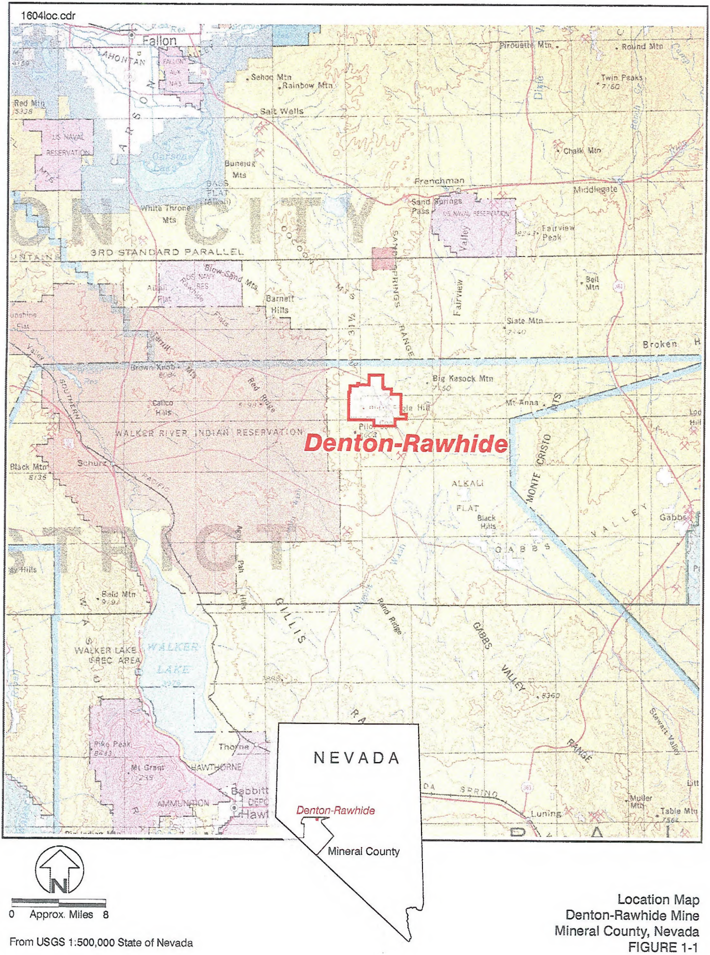
A portion of KRMC's proposed mine expansion would occur on public land administered by BLM; as such, operations must comply with BLM regulations for mining on public land (43 CFR 3809, Surface Management Regulations), the Mining and Mineral Policy Act of 1970, and the Federal Land Policy and Management Act of 1976. These laws operate in conjunction with the statutory right of mining claim holders to appropriate and develop federal mineral resources under the General Mining Law of 1872. These laws, in combination with other BLM policies (i.e., the Resource Management Plan), require BLM to analyze proposed mining operations to ensure that: (1) adequate provisions are included to prevent undue or unnecessary degradation of public land; (2) measures are included to provide for reasonable reclamation of disturbed land; and (3) proposed operations would comply with other applicable federal, state, and local statutes and regulations.

In addition to BLM, other federal, state, and local agencies have jurisdiction over certain aspects of the Proposed Action. **Table 1-1** provides a comprehensive listing of the agencies and identifies their respective permit/authorization responsibilities.

The U.S. Army Corps of Engineers (USCOE) has reviewed the proposed project and has determined that Section 404 of the Clean Water Act (i.e., wetlands and nonwetland waters of the U.S.) does not apply to activities associated with the project.

As required by the State of Nevada, KRMC has developed a Stormwater Pollution Prevention Plan for the Denton-Rawhide Mine complex (KRMC 1993a). An Emergency Response Plan and a Spill Prevention, Control, and Countermeasure Plan (KRMC 1993b) have also been developed for the project.

The State of Nevada bonding requirements for mine reclamation are outlined in Nevada Administrative Code (NAC) 519A.350 - 519A.630. For BLM, the Surface Management Regulations (43 CFR 3809) establish bonding policy relating to mining and mineral development. BLM and the



From USGS 1:500,000 State of Nevada

Location Map
Denton-Rawhide Mine
Mineral County, Nevada
FIGURE 1-1

State of Nevada have entered into a cooperative agreement establishing reclamation bond levels at not less than $2,000/acre for mining operations.

Estimated costs of reclamation are determined by mining companies using industry guidelines and standards for equipment, material, and labor rates. These rates are approved by BLM and the Nevada Division of Environmental Protection (NDEP) in establishing the actual bond amount.

RELATIONSHIP TO BLM AND NON-BLM POLICIES, PLANS, AND PROGRAMS

The Denton-Rawhide Mine amended Plan of Operations is in conformance with the minerals decision in the Record of Decision, Lahontan Resource Area, Resource Management Plan. Through the EIS process, the proposed Denton-Rawhide Project is being evaluated for conformance with existing land use guidelines by the State of Nevada and Mineral County.

PUBLIC SCOPING

A public scoping period has been provided by BLM to allow an early and open process for determining the issues related to the Proposed Action. A Notice of Intent to prepare this EIS was published in the Federal Register on January 24, 1996. Publication of this notice in the Federal Register initiated a public scoping period for the Proposed Action that welcomed comments through March 1, 1996.

BLM sent a project summary and maps to 66 individuals and organizations. These materials were also available at the public open house. The amended Plan of Operations was provided upon request. BLM issued a news release to four newspapers in the area surrounding the project site.

A public open house was held in Carson City on February 15, 1996. Separate meetings were held for Mineral County and Churchill County Commissioners. The Carson City open house was attended by one member of the public. No written or verbal comments were received during the Carson City open house. Issues identified by BLM during review of the Proposed Action and written comments received by BLM during the public scoping period are contained in a Scoping Summary which is available upon request from the Carson City District Office.

TABLE 1-1
Regulatory Responsibilities

Authorizing Action	Regulatory Agency
Plan of Operations	BLM
Clean Water Act (Section 404)	U.S. Army Corps of Engineers (USCOE)
Radio Station License	Federal Communications Commission
High Explosive License/Permit	Bureau of Alcohol, Tobacco, and Firearms
Industrial Artificial Pond Permit	Nevada Division of Wildlife (NDOW)
Water Appropriation Permits	Nevada Division of Water Resources (NDWR), State Engineer
National Pollutant Discharge Elimination System (NPDES) Permit	Nevada Division of Environmental Protection (NDEP)
Air Quality Permits to Construct and Permits to Operate	NDEP
Water Pollution Control Permit	NDEP
Mine Reclamation Permit	BLM/NDEP
Class III Landfill Waiver	NDEP
Potable Water	Nevada Division of Health (NDH), Department of Human Resources
Sewer System Approvals	NDH, NDEP
Radioactive Materials License	NDH
Safety Plan	Mine Safety and Health Administration (MSHA)
Threatened and Endangered Species Act	U.S. Fish and Wildlife Service (USFWS)

CHAPTER 2

DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

INTRODUCTION

This chapter describes existing mine operations at Kennecott Rawhide Mining Company's (KRMC) Denton-Rawhide Mine, proposed expansion activities (Proposed Action) at the Denton-Rawhide Mine, and reasonable alternatives to the Proposed Action. The location of the Denton-Rawhide Mine is shown in **Figure 1-1.**

Alternatives considered in the Environmental Impact Statement (EIS) are based on issues identified by the Bureau of Land Management (BLM) and public comments received during the public scoping process. The alternatives are intended to reduce or minimize potential impacts associated with the Proposed Action.

Chapter 2 includes detailed discussions of the following topics:

- History of mineral exploration and mining in the Denton-Rawhide Mine area.
- Description of existing Denton-Rawhide Mine operations.
- Description of the Proposed Action (mine expansion) for the Denton-Rawhide Mine.
- Alternatives to the Proposed Action, including the No Action Alternative and alternatives considered but dismissed from detailed analysis.

HISTORY OF EXPLORATION AND MINING

The project is located in the Regent Mining District near the abandoned mining camp of Rawhide. Active mineral exploration and small-scale mining began in the area in the early 1900s, with emphasis on silver, gold, and tungsten. Prior to the 1960s, these activities were directed at locating small high-grade deposits.

With the introduction of economical methods to recover silver and gold from low-grade ore, the emphasis shifted to finding and developing large, low-grade deposits.

In 1986, Rawhide Mining Company identified a mineable gold and silver deposit, and applied for agency approval to mine up to 36 million tons of ore over a 12-year period. Construction of the Rawhide Mine began in 1989 and gold and silver were produced for the first time the following year. This project, now known as the Denton-Rawhide Mine, continues to this day, and its expansion is the subject of this EIS.

GOLD AND SILVER MINERALIZATION

Gold and silver mineralization of the Denton-Rawhide Mine deposit is hosted by the Miocene-age Rawhide volcanic center, a 4.0-by 7.5-mile area of volcanic flow, vent, and air-fall deposits of various compositions (see Chapter 3 - Geology and Minerals for additional information). The Rawhide volcanic sequence was then tilted and deformed during emplacement of a siliceous intrusive complex. After the volcanic and intrusive magmas hardened into rock, faulting disrupted these rocks and created pathways for movement of mineralizing fluids and openings for deposition of gold and silver during continued igneous activity.

As gold- and silver-bearing fluids migrated upward along faults and fractures, they permeated the disrupted rocks throughout the area, forming northwest-trending, pod-shaped zones of gold mineralization. This resulted in both vein deposits and dissemination of fine gold particles and sulfide minerals throughout large volumes of rock. A large-tonnage, low-grade disseminated gold deposit was created, which is typically composed of submicron-sized gold particles often visible only with a scanning electron microscope. Many low-grade, large-tonnage mines have been identified in Nevada since exploration for disseminated gold was initiated in the 1960s.

Geologic and mineralization processes resulted in the formation of two ore types in the Denton-Rawhide Mine deposit. The uppermost or near-surface ore type, known as oxide ore, occurs to depths of 700 feet. This type of ore occurs where oxygen and precipitation percolating through the subsurface have combined to leach sulfide minerals from the rock. The natural leaching process leaves gold in the rock but removes sulfitic minerals.

A second ore type is unoxidized, or sulfide, that typically occurs at greater depths, where oxygen is low. Unoxidized ore is commonly rich in sulfides and can be refractory, or difficult to treat for recovery of precious metals.

The ratio of silver to gold concentrations in the Denton-Rawhide Mine deposit averages approximately 10:1 in the oxide and sulfide zones and generally increases with distance from the center of the ore bodies. Minor silver enrichment is present locally along the oxide-sulfide boundary.

EXISTING OPERATIONS

This section describes existing mining and ore-processing operations at the Denton-Rawhide Mine, including location, land ownership, mining activities, processing facilities, water supply, ancillary facilities, and current resource protection, reclamation, and monitoring activities.

Design, construction, operation, and reclamation of the Denton-Rawhide Mine are governed by State of Nevada regulations (NAC 445A.350 - 445A.447), and other applicable state and federal regulations. Surface disturbance was initiated at the Denton-Rawhide Mine in June of 1989. The Denton-Rawhide Mine is currently operating under Plan of Operations NV-36-86-03(P) and approved Reclamation Plan No. 0041.

LOCATION AND LAND OWNERSHIP

The Denton-Rawhide Mine is located in west-central Nevada approximately 55 road miles southeast of Fallon and 45 miles north of Hawthorne, Nevada. The mine lies in the northern end of Gabbs Valley, along State Route (SR) 839. Other communities in the area are Schurz, on the Walker Lake Indian Reservation approximately 30 miles to the west, and Gabbs to the east about 45 miles (**Figure 1-1**).

Existing Denton-Rawhide Mine facilities are located on public land administered by BLM and on private land controlled by KRMC. The mine and its processing facilities lie within a 1,593-acre, fenced area (**Figure 2-1**). Power and water lines providing services to the site are constructed within existing corridors. Telephone service is provided by digital microwave technology. **Figure 2-2** shows the status of land ownership in the project area.

CURRENT MINING OPERATIONS

The Denton-Rawhide Mine consists of an open-pit gold and silver mine with associated ore-processing and overburden disposal facilities. By the end of 1995, about 70 million tons of rock had been mined under existing state and federal permits (**Table 2-1**). Through mining and heap leaching operations, KRMC has recovered 546,000 ounces of gold and 4.4 million ounces of silver. By the end of 1996, an additional 20 million tons of rock are expected to be mined.

The mine has disturbed approximately 1,005 acres for mining, ore-processing, and related facilities (**Figure 2-1** and **Table 2-2**). These disturbances include roads, topsoil stockpiles, mine pits, waste rock disposal facility, ore stockpiles, crusher, heap leach pads, process water ponds, various buildings, drainage control ditches, and other minor structures.

The Denton-Rawhide Mine uses conventional cyanide heap leach processing technology. **Figure 2-3** is a schematic diagram of the existing operation.

Open-Pit Mining

Ore and waste rock have been mined from two pits - the Crazy Hill pit and Murray Hill pit (**Figure 2-1**). The Crazy Hill pit was mined between 1990 and 1993, followed by ongoing operations in the Murray Hill pit. This sequence allows backfilling of the Crazy Hill pit with waste rock from the Murray Hill pit, with the remainder of waste rock placed in the waste rock disposal facility. Ore with higher gold and silver content is hauled to the crusher where it may be stockpiled or directly crushed for placement on the leach pad. Ore with smaller amounts of gold and silver is either stockpiled for possible future processing or placed directly on the leach pad.

Conventional open-pit mining methods are used at the Denton-Rawhide Mine. Rock is excavated using a standard drill-blast-load-haul cycle. Rock is drilled and blasted in sequential benches 25 feet high to create final pit walls 50 to 75 feet high. Samples from blast-hole drilling are analyzed to determine if the rock is ore or waste. Loaders scoop up the blasted rock and load it onto haul trucks, which transport it to the appropriate place. This cycle is repeated throughout the mine schedule. **Table 2-1** shows operating and production information for current mine operations.

Waste Rock Disposal

Part of the waste rock from the Murray Hill pit was used to backfill the now-completed Crazy Hill pit. The waste rock now being produced from the Murray Hill pit is hauled to the waste rock disposal facility located east of the mine pits (**Figure 2-1**). The waste rock disposal facility is constructed in successive lifts with rock dumped from haul trucks. Bulldozers are used to maintain the top of the waste rock disposal facility for truck traffic.

Laboratory testing indicates most waste rock at the Denton-Rawhide Mine is not expected to produce acid when exposed to rainwater (see Resource Monitoring section in this chapter). However, as required by the Nevada Division of Environmental Protection (NDEP), waste rock is routinely sampled and analyzed for acid production potential. If these results, which are reported to NDEP, show the rock has the potential to become acidic, it is selectively buried within the disposal facility to isolate it from precipitation and oxygen.

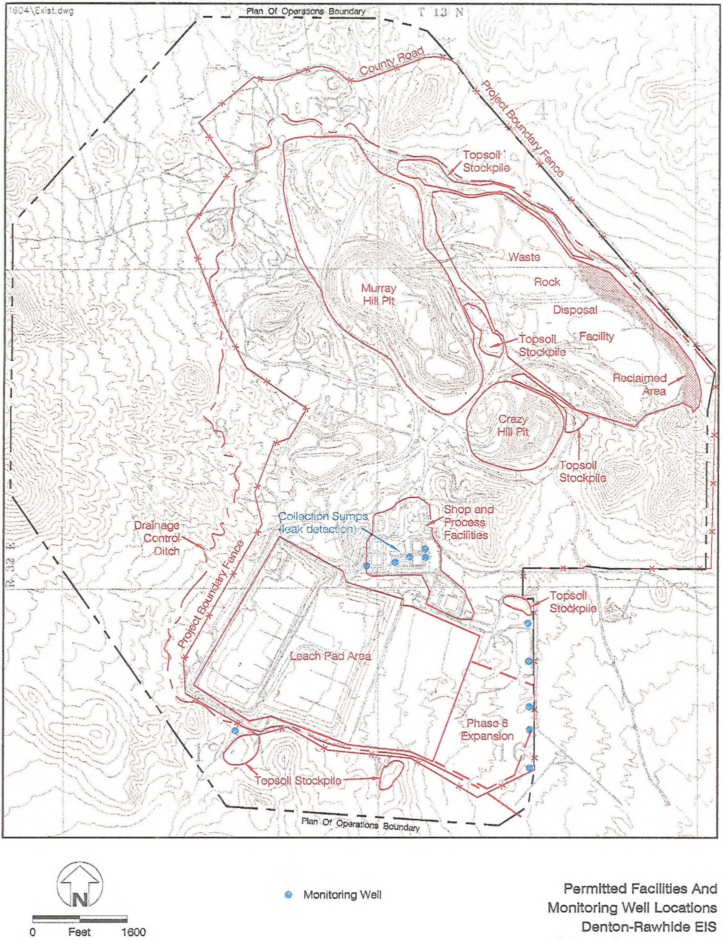
An authorized Class III landfill, permitted by the State of Nevada, is incorporated in the main waste rock disposal facility. Inert waste such as wood debris, rubble, concrete, and clean soil can be disposed of in a Class III landfill.

TABLE 2-1
Ore and Waste Rock Production (tons)
Existing Operations -- Denton-Rawhide Mine

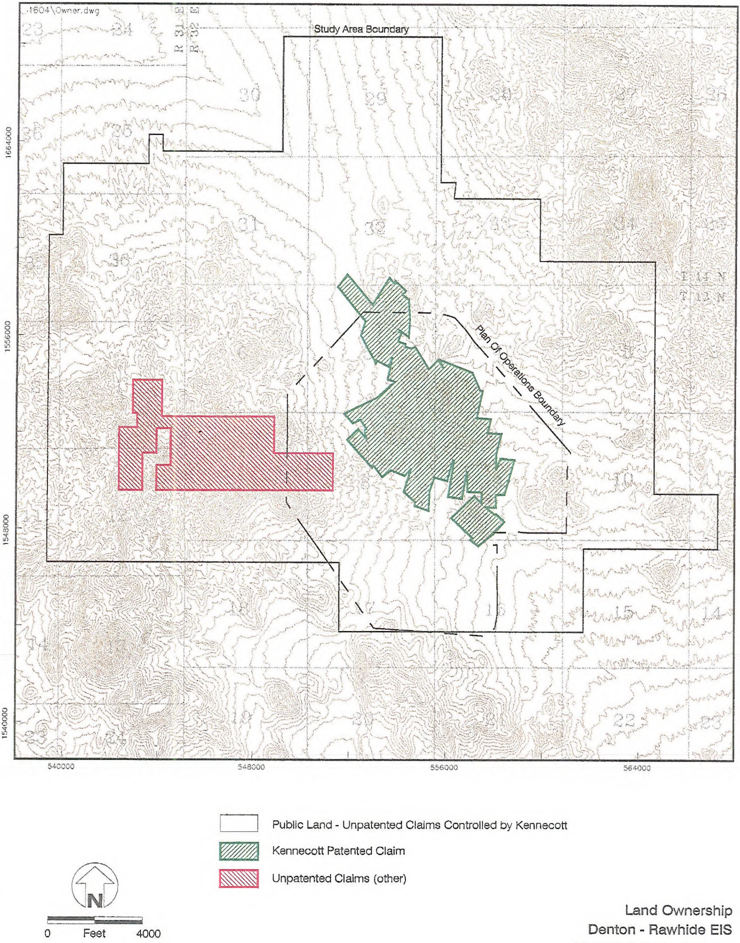
Ore and Waste Rock Categories	1990-1995	1996	Total 1990-1996
ORE MINED			
Crusher ore	30,365,000	5,812,000	36,177,000
Run-of-mine ore	0	2,906,000	2,906,000
Total Ora Mined	**30,365,000**	**8,718,000**	**39,083,000**
ORE PLACED			
Crusher ore	21,998,000	5,812,000	27,810,000
Run-of-mine ore	0	2,906,000	2,906,000
Total Ore Placad	**21,998,000**	**8,718,000**	**30,716,000**
WASTE ROCK MINED			
Crazy Hill backfill	10,503,000	3,120,000	13,173,000
Waste rock disposal facility	29,890,000	8,004,000	37,894,000
Total Waste Rock Mined	**39,943,000**	**11,124,000**	**51,067,000**
TOTAL MATERIAL MINED	**70,308,000**	**19,842,000**	**90,150,000**

TABLE 2-2
Existing Disturbance in the Denton-Rawhide Mine Area

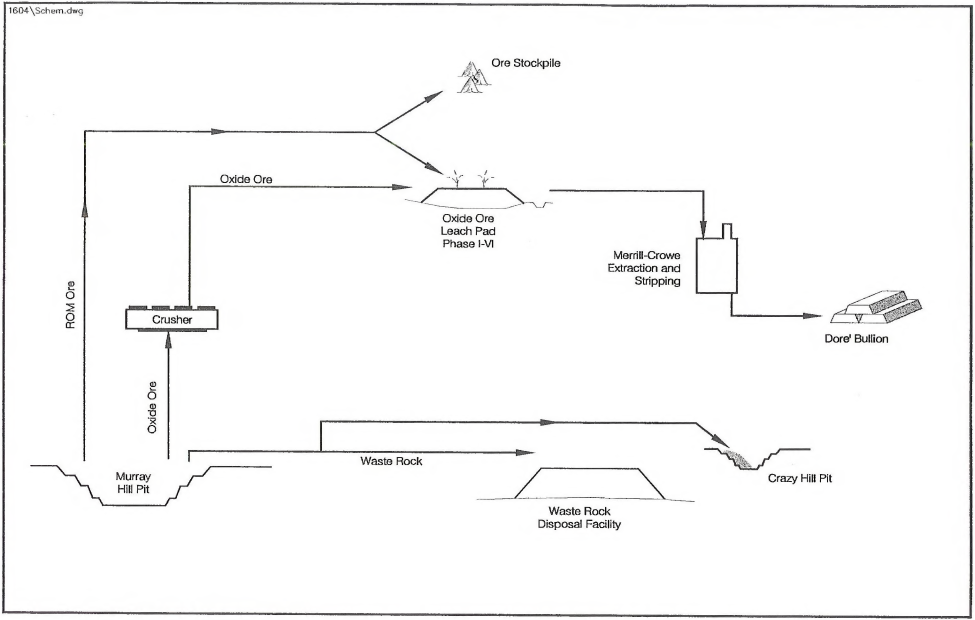
Development/Facility	Public Land (acres)	Private Land (acres)	Total (acres)
Murray Hill pit	2	171	173
Crazy Hill pit	0	26	26
Waste Rock disposal facility	145	56	201
Access/haul roads	23	21	44
Geologic evaluations	0	14	14
Leach pad	227	2	227
Ore stockpiles	36	36	75
Soil/growth medium stockpiles	18	41	59
Ancillary facilities	171	39	186
Total Disturbance	**598**	**407**	**1005**



Permitted Facilities And
Monitoring Well Locations
Denton-Rawhide EIS
Mineral County, Nevada
FIGURE 2-1



Land Ownership
Denton - Rawhide EIS
Mineral County, Nevada
FIGURE 2-2



Schematic of Existing Operations
Denton-Rawhide EIS
Mineral County, Nevada
FIGURE 2-3

Ore Crushing

Higher grade ore from the mine is crushed prior to placement on the leach pad. This exposes more surface area to the leaching solution and increases gold recovery. The crusher and low-grade ore stockpiles are located south of the mine pits, adjacent to the leach pad (**Figure 2-1**). Ore is fed to the crusher by 85-ton haul trucks where it is reduced to gravel-size material. Lime is added to the crushed ore prior to placement on the leach pad. Portable conveyors move ore from the crusher to the leach pad, where it is stacked with a stacking conveyor.

Heap Leaching

Heap leaching is used at the Denton-Rawhide Mine to recover gold and silver. The leach pads are permanent structures located at the south end of the project site (**Figure 2-1**). Crushed or run-of-mine (uncrushed, lean) ore is placed on a lined leach pad in successive lifts and drip irrigated with a water-based cyanide solution. The leaching solution percolates down through the heap, dissolving the gold and silver, until it reaches the drainage layer on top of the liners under the pad. Three-inch-diameter perforated pipes incorporated into the sloped drainage layer gravity feed the solution to collection ditches that connect to holding ponds at the recovery plant located north of the pads.

The leaching solution is kept alkaline (minimum pH of 10.5) by addition of lime. Maintaining the solution as alkaline prevents the release of hydrogen cyanide (HCN) gas and maintains the cyanide in solution. Addition of lime has the added benefits of protecting against long-term acid generation and inhibiting the mobility of other heavy metals that may be contained in the ore.

Gold and Silver Recovery

Gold and silver are recovered from the leaching solution at facilities located immediately north of the leach pad area (**Figure 2-1**). The plant consists of a series of double-lined solution holding ponds, recovery building, and pipelines connecting the system. Gold-bearing solution is stored in four "pregnant" ponds. The pregnant solution is pumped to the recovery building where the gold and silver are extracted from the solution. After extraction, the now "barren" solution is pumped to the barren pond where pH and cyanide levels are adjusted prior to recirculation to the leach pads. The sixth and seventh ponds contain make-up water for the process system. To provide maximum spill protection, the ponds are arranged in sequence such that, in the event of overflow, the pregnant ponds drain to the barren pond, which in turn drains to the make-up water pond. This ensures that the total pond volume is available for solution storage.

All ponds are fenced to prevent public and wildlife access, and completely covered with netting to prevent waterfowl and other birds from reaching the process solution. All of the holding ponds are permitted under an Artificial Industrial Pond Permit administered by Nevada Division of Wildlife (NDOW - Permit No. S11176). Ponds are also permitted by NDEP under a water pollution control permit (No. NEV88018).

In the recovery building, gold and silver are extracted from the pregnant solution using the Merrill-Crowe process, a technique that adds zinc dust to the pregnant solution to precipitate the precious metal. The zinc combines with the gold and silver, forming a solid precipitate. The gold-silver-bearing precipitate is collected, excess water removed, and the precipitate is sent to a small furnace for further processing. In the furnace, the precipitate is melted, driving off the zinc and leaving the remaining mixture of gold and silver to be poured into bars. The bars of impure bullion, called dore', are shipped to specialty refiners for final smelting. Flue gas from the furnace is routed through a condenser and baghouse prior to discharge.

Roads

Mine roads are used to access the site from the county road, haul ore and waste from the mine pit to various destinations, access mine facilities within the site, and allow developmental drilling within the operations boundary. All roads are unpaved, including the county road which KRMC has upgraded and partially relocated with the approval of Mineral County. KRMC maintains these roads and controls dust using water spray and soil binders. Mine haul roads are typically 80 to 100 feet wide and are constructed with necessary culverts, ditches, and wheel berms.

Drainage Control

There are no perennial streams within or adjacent to the site. Primary drainage control to carry off-site stormwater around the site is provided by the continuous drainage control ditch (**Figure 2-1**). The ditch is designed to safely route a 100-year, 24-hour storm event around the entire project site. All leach pads and process solution holding ponds are bermed to prevent stormwater runoff from flooding the project site.

Topsoil Stockpiles

Topsoil is salvaged during surface disturbances and placed in stockpiles located in the south and east portion of the project site (**Figure 2-1**). At the Denton-Rawhide project site, topsoil is defined as growth medium that includes fine- to coarse-grained alluvial material composed of clay, silt, sand, and gravel. Approximately 893,700 cubic yards of topsoil are stored in stockpiles at the Denton-Rawhide Mine.

Water Supply

The project requires 200 to 700 gallons per minute (gpm) to supply water for processing, dust control, and fire protection. Water is pumped 4 miles in a 10-inch diameter pipeline that is routed both above and below ground from two wells located southeast of the mine in the Gabbs Valley (**Figure 2-4**). A groundwater use permit for this water has been obtained from the Nevada State Engineer, and the pipeline shares a utility corridor with the powerline as approved by BLM in the original Plan of Operations.

Electrical Power and Telephone

Electrical power is supplied by a 4-mile, 13.8-kilovolt (kV) powerline linking the mine to a 60-kV transmission line located southeast of the mine site. A substation is located at the connecting point with the 60-kV transmission line. The 13.8-kV line is owned by KRMC, and the 60-kV line is owned by Sierra Pacific Power Company. The 13.8-kV feed line shares a utility corridor with the water supply pipeline permitted under the existing mine plan. Backup power is supplied by diesel generators.

Telephone service is provided by digital microwave equipment from Nevada Bell.

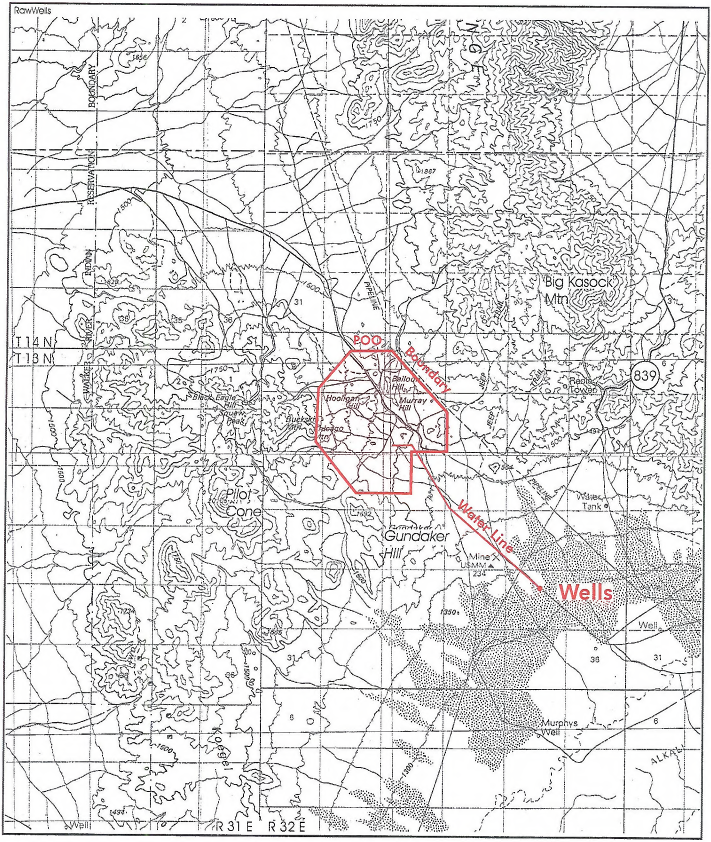
ANCILLARY FACILITIES

Other facilities at the Denton-Rawhide Mine include: (1) office, shop, laboratory, and warehouse buildings; (2) explosives storage; (3) gasoline and diesel fuel storage; (4) sewage disposal septic tank and leach field; (5) monitoring wells; and (6) air quality and weather monitoring stations. Most of these facilities are located in or near the "shop and process facilities" area shown in **Figure 2-1**.

RESOURCE MONITORING

Air Quality

Personnel from KRMC sample ambient air for particulates 10 microns or smaller (PM-10) and monitor/record meteorological conditions at the Denton-Rawhide Mine as specified by NDEP, Bureau of Air Quality. Dust from the crusher is controlled with baghouses and a pneumatic water spray system. A baghouse provides emission reduction for the furnace, and road dust is controlled using water or chemical binder (magnesium chloride). Meteorological monitoring has been conducted from the beginning of construction at the Denton-Rawhide Mine, and will continue until reclamation is complete.



From USGS 30x60 Fallon Quad

POO = Plan Of Operations

Water Supply Wells
Denton-Rawhide EIS
Mineral County, Nevada
FIGURE 2-4

KRMC maintains one air quality permit (No. AP1041-0353) for all mine components. Monitoring results for air quality are reported to NDEP, Bureau of Air Quality, within 60 days of the end of each quarter of the calendar year. Air quality levels at the Denton-Rawhide Mine currently meet Nevada and federal standards.

Water Resources

Except for infrequent storm runoff, no surface water or shallow groundwater exists at the site. Water monitoring at the mine site includes (**Figure 2-1**): (1) leak detection sumps located between the double liners for leach pads and process solution holding ponds; (2) six groundwater monitoring wells located near the leach pad; and (3) stormwater runoff from disturbed areas. KRMC maintains stormwater permit (No. GNV0022225) for the Denton-Rawhide Mine issued in 1993.

Solution ponds associated with the leach pad operation are sampled on a quarterly basis. Leach detection volumes are monitored on a weekly basis. All information is reported to NDEP as part of KRMC's Water Pollution Control Permit No. NEV88018. Six monitoring wells located downgradient from the leach pad site initially were monitored for solution migration. Monitoring of these wells, however, has been discontinued by NDEP because water or solutions were not detected.

Potentially Acid-Producing Rock

Rainfall and snowmelt seeping through sulfide-bearing rock may create sulfuric acid which can leach trace metals from ore and waste rock. NDEP requires testing of the acid-producing potential of the rock to be mined before and during the project. This testing, carried out in accordance with NDEP procedures, indicates the majority of both ore and waste rock at the Denton-Rawhide Mine is nonacidic. Also, the sparse rainfall in the area provides additional protection against creation and migration of acidic water.

Based on static tests for acid generation potential (AGP) and acid neutralization potential (ANP) of 27 rock alteration types at the Denton-Rawhide Mine, approximately 8 percent of all rock materials have the potential to generate acid. The remaining 92 percent of rock types to be excavated exhibit excess ANP (KRMC 1995).

Wildlife

Wildlife mortalities in the project area are reported to NDOW as part of the requirements of KRMC's Artificial Industrial Pond Permit (No. S11176). If a mortality is related to exposure from cyanide, KRMC reports the incident to NDOW within 24 hours. If the mortality is not related to cyanide exposure, KRMC reports this incident as part of the quarterly report.

HAZARDOUS MATERIALS

Hazardous materials and substances that are transported, stored, or used on-site in quantities that approach or exceed reporting requirements are summarized in **Table 2-3**. Small quantities of hazardous materials not included in **Table 2-3** are also present at the Denton-Rawhide Mine. These materials are stored in amounts less than 5 gallons and considerably less than reporting requirement threshold quantities and are contained in commercially produced paints, office products, automotive maintenance products, and laboratory chemicals. "Hazardous materials" are defined in 49 CFR 172.101; "hazardous substances" are defined in 40 CFR 302.4 and the Superfund Amendments and Reauthorization Act (SARA) Title III (U.S. Environmental Protection Agency 1995).

Hazardous materials are transported to the Denton-Rawhide Mine by U.S. Department of Transportation (DOT)-regulated transporters and stored on-site in DOT-approved containers. Hazardous material, including explosives, are managed in accordance with requirements outlined in the KRMC Hazardous Materials Storage Permit (Nevada State Fire Marshal 1996) and the KRMC Bureau of Alcohol, Tobacco and Firearms license/permits (U.S. Department of Treasury 1996a and 1996b).

Spill containment structures and pollution prevention procedures are in place for storage containers of hazardous materials (KRMC 1993a and 1993b). All hazardous materials are stored on private land at the Denton-Rawhide Mine. Emergency Response Plans for the mine address potential incidents at the project site and associated rights-of-way (KRMC 1993b).

HAZARDOUS WASTE

The Denton-Rawhide Mine currently operates as an exempt small quantity generator of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA) (KRMC 1996a). A small quantity hazardous waste generator is a facility that generates less than 1,000 kilograms per month of RCRA-regulated hazardous waste (40 CFR Part 262). All hazardous waste currently generated at the Denton-Rawhide Mine is reused on-site, with the exception of minor amounts of waste which are stored until sufficient quantities are collected to warrant off-site transport to an appropriate disposal facility.

HUMAN HEALTH AND SAFETY

The Denton-Rawhide Mine is subject to the Federal Mine Safety and Health Act of 1977 (MSHA), which sets mandatory safety and health standards for surface metal and nonmetal mines, including open-pit mines. The purpose of these standards is the protection of life, promotion of health and safety, and prevention of accidents. Regulations promulgated under MSHA are codified under 30 CFR Subchapter N, Part 56.

Employment

KRMC presently employs approximately 173 people at the Denton-Rawhide Mine. Most employees live in or near the towns of Fallon, Schurz, and Hawthorne.

Reclamation

In December of 1993, KRMC filed a reclamation plan with NDEP addressing mining activities at the Denton-Rawhide Mine. NDEP issued KRMC an approved Reclamation Plan (No. 0041) in 1994. The reclamation plan described in this section addresses both existing mine land and land included in the proposed expansion at the Denton-Rawhide Mine. These reclamation procedures and plans were developed by KRMC in response to regulations adopted by BLM and NDEP (BLM 1992 and NAC 519A.245) and apply to both public and private land at the Denton-Rawhide Mine. Reclamation plans may be modified in consultation with BLM and NDEP as reclamation test plot data become available.

The primary objective of KRMC's reclamation plan is to reclaim disturbed land at the Denton-Rawhide Mine to their pre-mining land use conditions. This will be achieved through stabilization, erosion control, revegetation, and aesthetic enhancement of mined areas. Pre-existing disturbances that lie within the Denton-Rawhide Mine project boundaries will either be mined or reclaimed. No reclamation is planned for pre-existing disturbances located outside the Denton-Rawhide Mine project boundary.

Primary components of KRMC's reclamation plan include constructing berms around the pits, grading waste rock disposal facilities and haul roads, constructing drainage ditches, neutralizing the heap leach pad, applying growth media where needed, dismantling and removing all facility structures, and seeding and revegetation.

In general, reclamation at the Denton-Rawhide Mine will be conducted in three phases. Phase I reclamation work will include berming the pit walls and reclaiming waste rock dumps and haul roads (continue for 2 years after mining operations cease). Phase II activities include reclamation of the heap leach pad and associated facilities (e.g., ditches, ponds, process facilities). Phase II reclamation activities will last for approximately 9 years. Access and exploration roads, drill sites, and facility sites will be reclaimed under Phase III during a period of about 4 years. All reclamation activities will be completed by year 2016.

TABLE 2-3
Hazardous Materials Management
Denton-Rawhide Mine

Substance	Occurrence	TPQ[1]	TQ[2]	313[3]	Maximum Amount Stored [4]	Storage Method
		(Pounds)				
Toluene	in paint, solvents and gasoline	--	--	X	1,100 gal	cans/warehouse fire cabinet, process fire cabinet, and maintenance shop tank/tank farm
Biphenyl	in diesel fuel	--	--	X	410 gal	tank/tank farm
Benzene	in gasoline	--	--	X	600 gal	tank/tank farm
Naphthalene	in diesel fuel	--	--	X	1,230 gal	tank/tank farm
Nitroglycerine	in dynamite	--	--	X	85 lbs	boxes/powder magazine
Ammonium nitrate	ammonium nitrate	--	--	X	100,000 lbs	tank/powder magazine
Sodium cyanide	sodium cyanide	100	--	--	90,000 lbs	above ground/heated, insulated/process yard & mixing station
Zinc	zinc dust	--	--	X	45,120 lbs	50-lb cans/process yard & mezzanine level process building
Hydrochloric acid	hydrochloric acid	500	5,000	X	4 gal	glass bottles/lab acid cabinet
Sulfuric acid	sulfuric acid	1,000	--	X	9.5 gal	glass bottles/lab acid cabinet
Nitric acid	nitric acid	1,000	--	X	6.7 gal	glass bottles/lab acid cabinet
Ethylene glycol	antifreeze	--	--	X	4,000 gal	tank/tank farm
Propane	propane and small amounts of aerosol lubricant & choke cleaner	--	--	--	8,500 gal	tanks located in maintenance, lab and crusher areas and small cans
Hydrocarbons	15 - 40W lube oil	--	--	--	4,000 gal	tank farm
	10W lube oil	--	--	--	3,000 gal	tank farm
	85-140W lube oil	--	--	--	10,600 gal	tank farm
	gear lube oil	--	--	--	4,000 gal	tank farm
	50W lube oil	--	--	--	550 gal	tank farm
	30W lube oil	--	--	--	550 gal	tank farm

[1] TPQ = Threshold planning quantity for extremely hazardous substances. Any stored amount at or exceeding this quantity is subject to state and local reporting.

[2] TQ = Threshold quantities for chemicals listed for accidental release prevention. If stored chemicals exceed this quantity, the facility is subject to accident prevention regulations under Clean Air Act Section 112(r).

[3] 313 = "X" indicates facilities storing more than 25,000 pounds of the chemical (if it is used for manufacturing or processing), or 10,000 pounds (if used otherwise) are subject to local and federal reporting requirements.

[4] gal = gallons

lbs = pounds

-- = no reporting requirements for column category.

Source: KRMC 1996b

Soil Salvage

There is not sufficient topsoil at the Denton-Rawhide Mine to cover all areas planned for disturbance with 6 inches of topsoil. True topsoil is very scarce in the project area and is similar to alluvium that will also be used as a growth medium. Most of the alluvium will be excavated from the Crazy Hill and Murray Hill pits. Although the alluvium is slightly alkaline, vegetation along roads constructed with the alluvium indicate it is an adequate growth medium for native plant species. All disturbance areas, excluding open pits, will be covered with 6 inches of topsoil or alluvial growth medium. Growth media stockpiles will be constructed with 3H:1V slopes to facilitate efficient salvage and redistribution. Approximately 893,700 cubic yards of growth medium have been salvaged and stockpiled for use in reclamation at the project area.

Revegetation

Disturbed areas will be revegetated concurrently with reclamation activities. Disturbed areas will be regraded and recontoured to provide drainage. All access roads and compacted areas (e.g., parking lots, process and refinery sites, drill sites) will be ripped to a depth of approximately 12 inches prior to seeding. KRMC has initiated a test-plot program to determine which seed mixtures will best complement the reclamation plan. Various species of grasses, forbs, and shrubs were selected for the test plots based on recommendations of the National Resource Conservation Service (NRCS) and BLM. Each species was plotted in various settings, in various growth media (topsoil and alluvium), and using various seeding techniques (hand broadcasting, disking, and grousering). A desired plant community will be selected based on results of the test plot program and with agency approval. Revegetation would consist of pure live seed (PLS) of species which respond favorably on seed test plots. Plant species and application rates are presented in **Table 2-4** (Agra Earth and Environmental, Inc. (Agra) 1995). Although shrubs are included in the proposed seed mix, shrub development would take several years following revegetation to attain pre-disturbance density and stature.

Based on recommendations provided by NRCS, fertilizers will not be used to promote vegetation because commercial fertilizers may be detrimental to plant growth under low moisture conditions. In addition, soil amendments (e.g., mulches and tackifiers) will not be used unless information obtained from the test plots indicates they will improve plant growth.

Mine Pits

After mining is completed, the Murray Hill pit will be safety bermed and signed to discourage human and wildlife entry. A total of 22,250 linear feet of berms will be constructed to enclose approximately 152 acres of pit area. The berms will be placed approximately 100 feet from the crest of the highwall to prevent breaching in the event of highwall failure. Stability analyses indicate pit walls will remain stable (Piteau Associates 1986). Since climate at the Denton-Rawhide Mine is arid and pit development will not intercept groundwater, water is not expected to accumulate in the pits.

Waste Rock Disposal Facility

The majority of waste rock mined at the Denton-Rawhide Mine consists of oxidized volcanic rock and alluvium. Results of acid generation potential tests conducted on the oxidized waste rock indicate the material has a net acid neutralization potential (KRMC 1995). Unoxidized sulfides are expected to be encountered in deeper parts of the pit. Sulfitic waste rock encountered during mining operations will be covered by a minimum of at least 4 feet of oxide material to buffer the potentially acid-producing rock and inhibit infiltration of precipitation.

The waste rock disposal facility will be graded to a minimum 3H:1V (33 percent) slope to provide stable slopes for vegetation and promote runoff. The disposal facility will then be covered with at least 6 inches of topsoil/growth medium and revegetated as outlined in the Revegetation section of this chapter.

TABLE 2-4
Seed Types and Application Rates

Species	Pure Live Seed (PLS) lbs/acre
Indian ricegrass	1.0
Bottlebrush squirreltail	3.0
Desert globemallow	1.0
Shadscale	5.0
Fourwing saltbush	3.0
Douglas rabbitbrush	1.0
Nevada ephedra	2.0
Spiny hopsage	3.0
Kochia	2.0

Heap Leach Pad

Residual cyanide solution in the leach pad will be neutralized using one or more of the following methods: natural degradation, fresh water rinsing, or chemical rinsing. Residual cyanide will be neutralized to conform with regulations established in NAC 445.242-388. After the heap leach pad is neutralized, the heap will be graded to a 2.5-3H:1V slope to provide stable slopes for vegetation. Drainage ditches will be constructed to divert runoff and eliminate impoundments. Steeper drainage channels will be riprapped to prevent erosion.

Ditches and ponds associated with the leach pad will also be neutralized. When neutralization is complete, the HDPE liners will be gathered and buried within the ponds. Pond embankments will be breached, and the ponds will be backfilled with alluvium and graded to blend with surrounding land. Approximately 6 inches of growth media will be applied to the leach pad and the area will be revegetated using methods described in the Revegetation section of this chapter.

Haul Roads

All access roads, parking lots, ore-processing and refinery sites, crusher site, exploration roads, and drill sites will be ripped to a depth of approximately 12 inches, dozed, recontoured, and scarified to provide a proper seed bed. Topsoil or alluvium will not be applied to these areas because they were constructed with alluvium or near-surface materials that should provide adequate vegetative growth. All reclaimed compacted areas will be revegetated as described in the Revegetation section of this chapter.

Ancillary Facilities

All major assets including the crusher, shop, process and refinery building, rolling stock, portable buildings, and office trailers will be removed from the property for reuse or disposal at a Class III landfill. Concrete slabs, foundations, and retaining walls will be broken up, buried, and the area revegetated.

Monitoring/Evaluation of Reclamation Success

After all mining operations cease, KRMC will implement a reclamation monitoring plan to ensure that reclamation measures are effective. Monitoring will include periodic inspection of the perimeter fence installed to protect new vegetation and prevent unauthorized entry. Climatic data will be recorded and periodically reviewed to determine potential weather-related effects on reclamation success.

PROPOSED ACTION

PROPOSED MINING OPERATIONS

Mineral exploration by KRMC has identified additional ore reserves in the Murray Hill pit area. KRMC proposes to amend its BLM Plan of Operations to increase production at the Denton-Rawhide Mine as follows:

- Expand the Murray Hill pit.
- Expand the Murray Hill waste rock disposal facility.
- Construct and operate a run-of-mine (ROM) heap leach pad with process ponds.

To accommodate the expanded mine facilities, KRMC also proposes to:

- Enlarge the permitted project area.
- Move the boundary fence to enclose the expanded project.
- Relocate the drainage control ditch to protect the expanded project area.
- Modify the route of the county road.

No other changes in the existing general mining or gold and silver recovery are proposed for the expansion. The reclamation plan for the Denton-Rawhide Mine would be modified to incorporate the expanded and new disturbance areas.

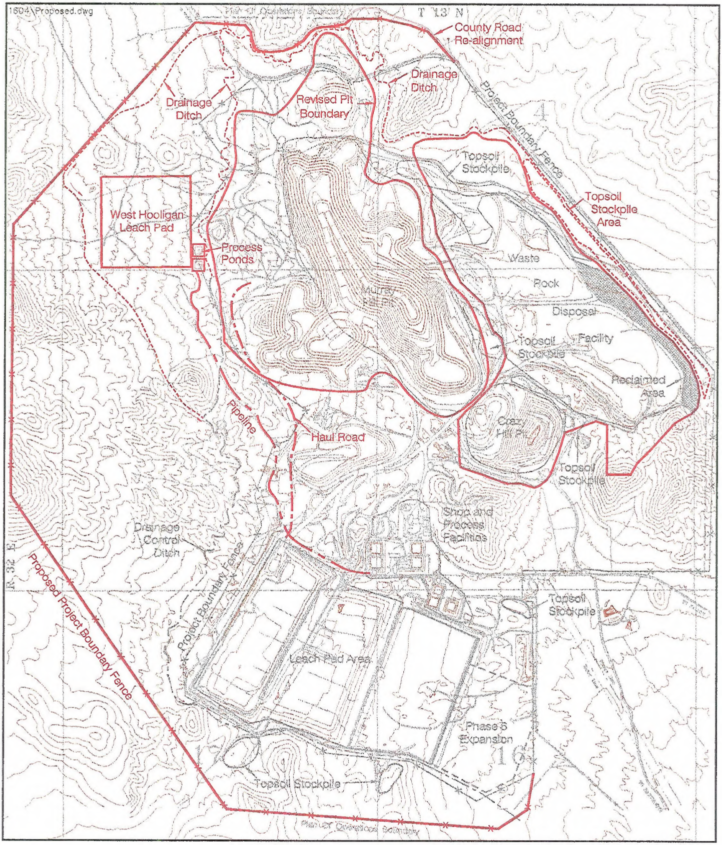
Figure 2-5 shows the layout of the proposed mine expansion (Proposed Action) **Figure 2-6** is a schematic diagram depicting the change in mine operations for the Proposed Action. Waste rock and ore production for the Proposed Action are summarized in **Table 2-5** and proposed new disturbance areas are listed in **Table 2-6**.

MURRAY HILL PIT EXPANSION

KRMC proposes to enlarge the Murray Hill pit as indicated in **Figure 2-5**. The pit expansion would add 200 acres of disturbance area (52 acres public land and 148 acres private land; **Table 2-6**). An additional 69.5 million tons combined ore and waste rock would be excavated as a result of the proposed expansion (years 1997-2001).

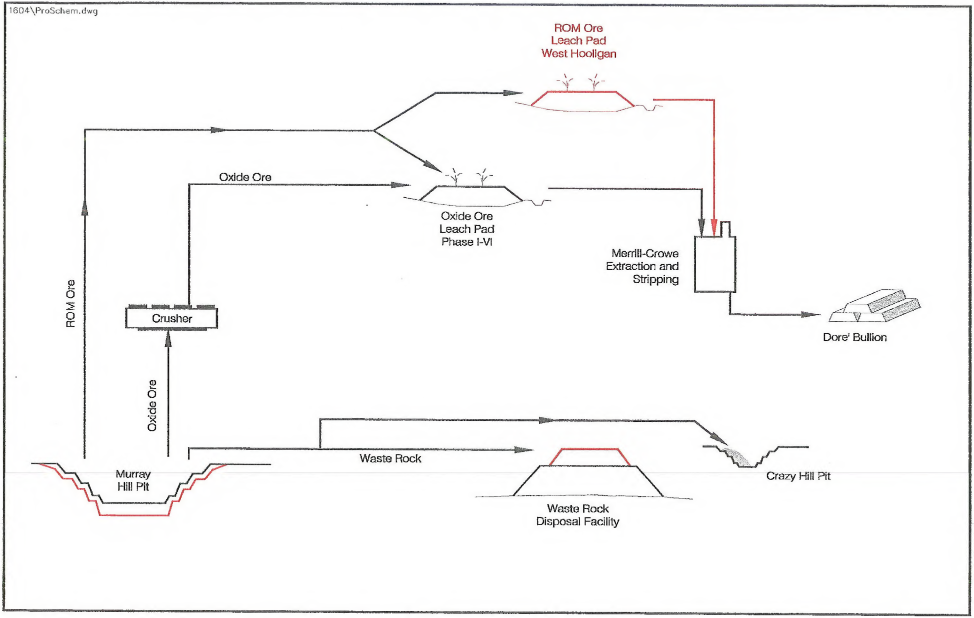
WASTE ROCK DISPOSAL FACILITY

KRMC would continue to dispose of waste rock in the existing waste rock disposal facility located east of the Murray Hill pit. Approximately 37 million additional tons of waste rock would be disposed of in this facility, bringing the total to 75 million tons. The waste rock disposal facility would reach an ultimate height of 200 feet above the natural ground surface. An additional 60 acres (17 acres public and 43 acres private land) would be disturbed by the proposed expansion of the waste rock disposal facility.



Proposed Facilities (red)
Existing Facilities (gray)

Proposed Facilities
Denton-Rawhide EIS
Mineral County, Nevada
FIGURE 2-5



Proposed Operations (red)
Existing Operations (black)

Schematic of Proposed Operations
Denton-Rawhide EIS
Mineral County, Nevada
FIGURE 2-6

TABLE 2-5
Ore and Waste Rock Production (tons)
Proposed Operations -- Denton-Rawhide Mine

Ore and Waste Rock Categorie	1997	1998	1999	2000	2001	Total 1997-2001
ORE MINED						
Crusher ore	6,000,000	4,619,000	6,000,000	1,938,000	0	18,557,000
Run-of-mine ore	2,940,000	4,157,000	5,340,000	1,744,000	0	14,181,000
Total Ore Mined	**8,940,000**	**8,776,000**	**11,340,000**	**3,682,000**	**0**	**32,738,000**
ORE PLACED						
Crusher ore	6,000,000	6,000,000	6,000,000	6,000,000	2,924,000	26,924,000
Run-of-mine ore	2,940,000	4,157,000	5,340,000	1,744,000	0	14,181,000
Total Ore Placed	**8,940,000**	**10,157,000**	**11,340,000**	**7,744,000**	**2,924,000**	**41,105,000**
WASTE ROCK MINED						
Crazy Hill backfill	0	0	0	0	0	0
Waste rock disposal facility	11,530,000	12,133,000	11,250,000	1,853,000	0	36,766,000
Total Waste Rock Mined	**11,530,000**	**12,133,000**	**11,250,000**	**1,853,000**	**0**	**36,766,000**
TOTAL MATERIAL MINED	**20,470,000**	**20,909,000**	**22,590,000**	**5,535,000**	**0**	**69,504,000**

TABLE 2-6
Proposed New Disturbance in the Denton-Rawhide Mine Expansion Area

Proposed Activities	Public Land (acres)	Private Land (acres)	Total (acres)
Murray Hill pit	52	148	200
Waste rock disposal facility	17	43	60
ROM leach pad (west Hooligan) and process ponds	84	8	92
Diversion ditch	10	2	12
TOTAL	**163**	**201**	**364**

Note: ROM = run-of-mine

LEACH PAD

The West Hooligan Leach Pad would be constructed to process run-of-mine (ROM) ore recovered from the Murray Hill pit expansion (see **Figure 2-5**). Approximately 92 acres (84 acres public and 8 acres private land) would be disturbed to construct this pad and associated process ponds located west of the Murray Hill pit (**Table 2-6**). The leach pad would have a design capacity of 8 million cubic yards of ore, or approximately 14 million tons.

Leach pad construction would follow NDEP requirements and would be preceded by removal and stockpiling of growth media. After grading and compaction of the site, a high density polyethylene liner (HDPE) would be installed. The leach pad would be equipped with a leak detection system and sump to detect and control potential leaks in the liner system.

The leach pad site would be bermed to control process solutions and to reduce surface water run-on to the leach pad area. The relocated diversion channel would be routed around the western perimeter of the West Hooligan Leach Pad site (**Figure 2-5**).

Recirculation and process solution ponds would be constructed to contain cyanide process solutions for the leach pad. The pond system would disturb 8 acres of private land at the leach pad site (**Figure 2-5** and **Table 2-6**).

Process pond construction would be preceded by removal and stockpiling of growth media to be used for reclamation. Pond bottoms would be compacted prior to installation of a double liner system using HDPE synthetic liners. The ponds would also have leak detection systems installed. All pond construction would be completed in accordance with NDEP requirements.

ENLARGED PERMIT AREA

To allow expansion of the Denton-Rawhide Mine, KRMC proposes to enlarge the permitted area as shown in **Figure 2-5** (Plan of Operations boundary). The project area would be expanded by 1,012 acres, bringing the total operations area to 2,605 acres.

BOUNDARY FENCE

The boundary fence would be moved and lengthened to encompass the proposed permit area (**Figure 2-5**). The fence would consist of four-strand barbed wire.

DRAINAGE CONTROL DITCH

To provide drainage control for the expanded project, KRMC proposes to relocate the existing drainage control ditch as shown in **Figure 2-5**. The ditch would be designed to intercept and transport the flow from a 100-year, 24-hour storm event. Construction of the ditch would disturb approximately 12 additional acres (10 acres public land and 2 acres private land; **Table 2-6**).

RESOURCE MONITORING

Air Quality

Air resource monitoring would continue pursuant to current permits and regulations, as discussed in Resource Monitoring under Existing Operations in this chapter.

Water Resources

Water resource monitoring would continue pursuant to current permits and regulations, as discussed in Resource Monitoring under Existing Operations in this chapter.

Potentially Acid-Producing Rock

Monitoring of waste rock would continue according to existing permits and regulations, as discussed in Resource Monitoring under Existing Operations in this chapter.

HAZARDOUS MATERIALS AND HAZARDOUS WASTE

KRMC does not anticipate increased levels or types of hazardous materials or hazardous waste transported, generated, stored, used, treated, or recycled at the Denton-Rawhide Mine. Hazardous material and hazardous waste management is described in Existing Operations in this chapter.

HUMAN HEALTH AND SAFETY

Human health and safety programs and requirements would be the same as those described under Human Health and Safety in Existing Operations in this chapter.

EMPLOYMENT

KRMC presently employs approximately 173 people at the Denton-Rawhide Mine. No change in size of the permanent work force is anticipated as a result of the Proposed Action.

RECLAMATION

Additional areas disturbed under the Proposed Action would be reclaimed using the same procedures as those described in the reclamation plan for the existing and proposed operations. Berms would be constructed around the perimeter of the Murray Hill pit to discourage human and wildlife entry. The waste rock disposal facility would be graded to a minimum 3H:1V slope to provide stable slopes for vegetation and promote surface water runoff. The dump would then be covered with at least 6 inches of growth media and revegetated. Residual cyanide solution in the ROM heap leach pad would be neutralized. The heap would then be graded to a 2.5-3H:1V slope, covered with growth media, and revegetated. Ponds and ditches associated with the ROM leach pad would also be neutralized and liner materials would be buried in-place. **Figure 2-7** shows topography of the mine area after regrading and reclamation; cross-sections of post-reclamation topography are shown in **Figure 2-8**.

PROJECT ALTERNATIVES

Two alternatives are evaluated in the EIS: Alternative A - partial backfilling of the Murray Hill pit; and the No Action Alternative. Minor issues and impacts identified in Chapter 4, Consequences of the Proposed Action and Alternatives, are addressed with specific mitigation measures instead of with alternatives.

ALTERNATIVE A - PARTIAL BACKFILLING OF THE MURRAY HILL PIT

Consideration of backfilling mine pits as an alternative is consistent with NAC 519A.250 concerning solid minerals reclamation standards and policy statements outlined in the Federal Land Policy and Management Act (PL-94-579, 43 USC 1701). This alternative would include all components of the Proposed Action and would require KRMC to modify its project schedule to backfill southern and northern portions of the Murray Hill pit. **Figure 2-9** shows the portions of the Murray Hill pit which would be backfilled if Alternative A is implemented.

A total of 440,000 tons of waste rock would be backfilled in the northern backfill area and 3.6 million tons of waste rock would be used in the southern portion. The approximately 4 million tons of waste rock used for backfill would reduce the ultimate height of the waste rock disposal facility by about 10 feet.

Backfilling the northern and southern portions of the Murray Hill pit would restore approximately 35 acres of land surface to productive use after cessation of mining. The backfilled land surfaces would be reclaimed in accordance with the existing reclamation plan, including grading, placement of growth media, and seeding with a seed mixture described in this chapter under Existing Operations (see **Table 2-4**).

Waste rock used in backfilling portions of the Murray Hill pit would have a net neutralizing capacity. No acid rock drainage would be expected from backfilled portions of the pit.

NO ACTION ALTERNATIVE

Under the No Action Alternative, BLM would not authorize the proposed Plan of Operations; therefore, further disturbance to public land would not occur. Impacts of the No Action Alternative are discussed in Chapter 4 for each resource area. Reclamation of permitted facilities would take place upon mine closure in accordance with the current Plan of Operations.

AGENCY PREFERRED ALTERNATIVE

The Agency Preferred Alternative is Alternative A - partial backfilling of the Murray Hill Pit.

ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

This section describes alternatives identified through the scoping process that were considered by BLM but dismissed from detailed analysis for reasons described below.

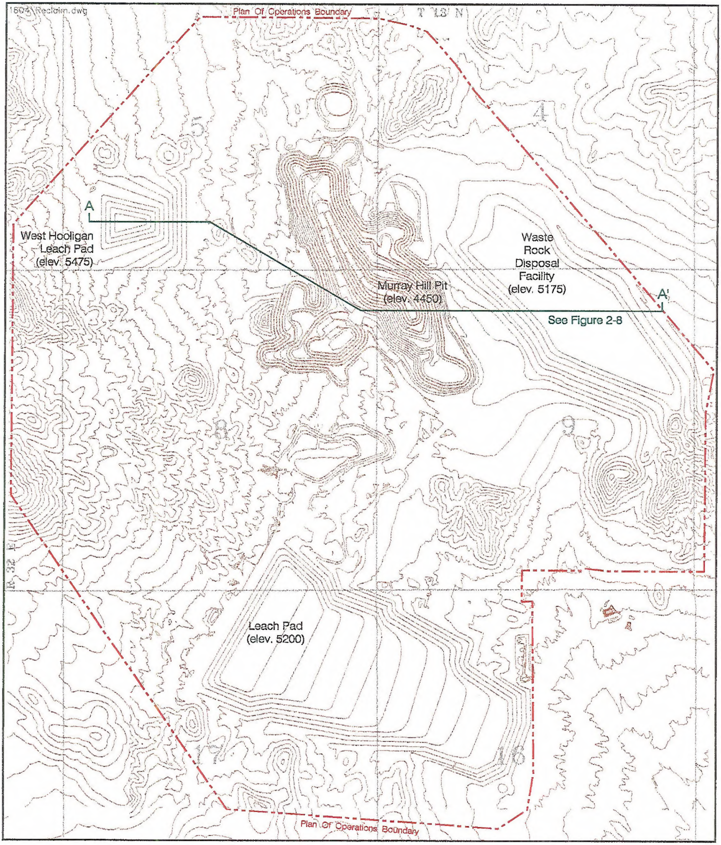
Complete Backfilling of the Murray Hill Pit

This alternative was developed in response to NAC 519A.250 concerning solid minerals reclamation standards and policy statements contained in the Federal Land Policy and Management Act (PL-94-59, 43 USC 1701), requiring BLM to review the feasibility of backfilling open pits.

This alternative would require modification of the mining and reclamation schedule so that approximately 70 percent of the waste rock generated during mining would be rehandled to backfill the pit. Not all of the waste rock could be placed back in the pit because of an anticipated 30 percent bulking factor. This material would remain in the waste rock disposal facility.

Complete backfilling would restore about 373 acres of land to productive use after mining. The restored land surface would be available for post-mining land uses such as wildlife habitat.

This alternative was eliminated from detailed analysis because rehandling of waste rock would be economically and operationally unfeasible and none of the impacts resulting from the Proposed Action would be significantly changed by completely backfilling the Murray Hill pit. An exemption to leave open pits at cessation of mining has been granted under KRMC's existing reclamation plan for the Denton-Rawhide Mine.


1604 Reclaim.dwg
Plan Of Operations Boundary
T 13 N
5
4
A
West Hooligan Leach Pad (elev. 5475)
Murray Hill Pit (elev. 4450)
Waste Rock Disposal Facility (elev. 5175)
A'
See Figure 2-8
8
9
R 32 E
T 13 N
Leach Pad (elev. 5200)
17
16
Plan Of Operations Boundary
N
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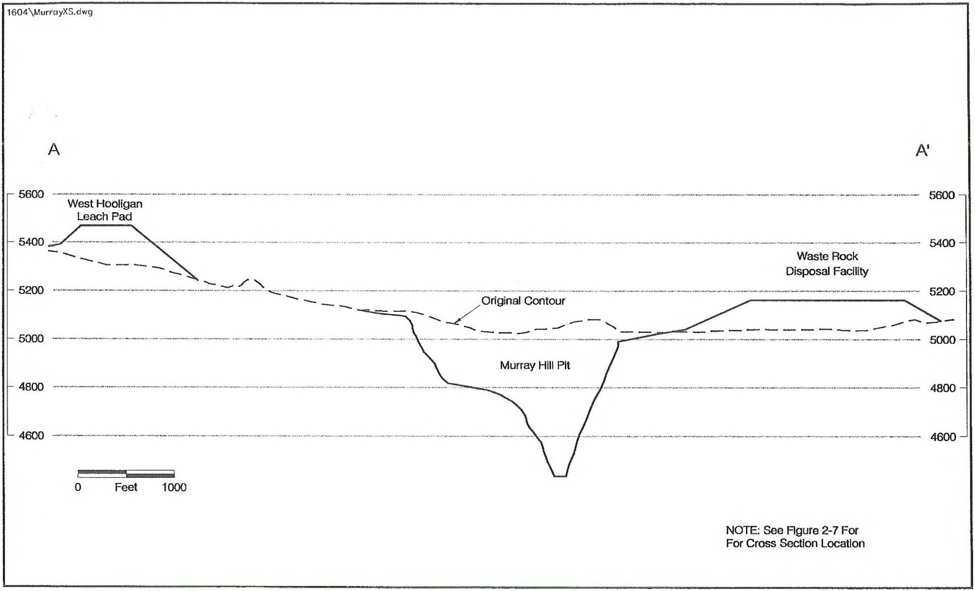
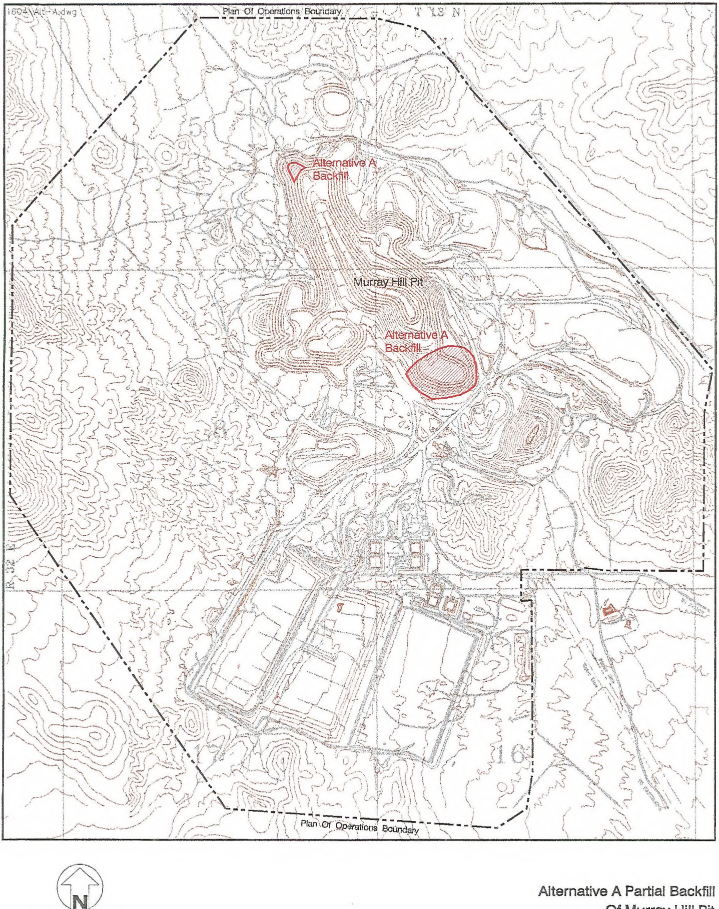
Post-Reclamation Topography
Denton-Rawhide EIS
Mineral County, Nevada
FIGURE 2-7



Murray Hill Pit Cross-Section
Denton - Rawhide EIS
Mineral County, Nevada
FIGURE 2-8



Alternative A Partial Backfill
Of Murray Hill Pit
Denton-Rawhide EIS
Mineral County, Nevada
FIGURE 2-9

CHAPTER 3

AFFECTED ENVIRONMENT FOR PROPOSED ACTION AND ALTERNATIVES

INTRODUCTION

Descriptions of present environmental conditions in the Denton-Rawhide Mine project area are included in this chapter. The project area is located in northwestern Nevada in Mineral County, approximately 55 miles southeast of Fallon **(Figure 1-1)**. The Denton-Rawhide Mine lies on the northwest end of the Gabbs Valley. Elevations range from 4,300 to 5,300 feet above mean sea level (AMSL).

Figure 3-1 shows the general study area for most resource investigations associated with the mine area. The study area boundaries for social and economic resources, recreation and wilderness, access and land use, and air resources extend beyond the boundaries identified on **Figure 3-1**. The study area boundary for each of these resources is described in the text under each resource discussion.

The study area boundary for each resource is based on the predicted locations of direct and indirect impacts resulting from the Proposed Action and alternatives. Wild horses and unique prime farmlands are not addressed in this EIS because these resources are not present in the study area.

Chapter 3 contains a summary of environmental baseline information for each resource. The "project area" referred to in this EIS includes areas associated with the existing mine, the Proposed Action, and lands immediately surrounding the existing mine. The project area is coincident with the "Plan of Operations" boundary shown in **Figure 3-1**.

GEOLOGY AND MINERALS

The Denton-Rawhide Mine project area is located within the Basin and Range Physiographic Province, a region that extends over most of Nevada and parts of adjoining states. Range-front faulting in the province has created fault-block mountain ranges that are separated by broad valleys filled with alluvium. A generalized geologic history of the Denton-Rawhide Mine regional study area is summarized in **Table 3-1**.

Gold and silver deposits of the Denton-Rawhide Mine occur along the northern portion of Walker Lane, a northwest-trending structural zone of the Basin and Range province. The Denton-Rawhide Mine deposit is also located along the northeastern margin of the Miocene-age Rawhide volcanic center, a 4- to 7.5-mile area of volcanic intrusions, flows, and sedimentary deposits.

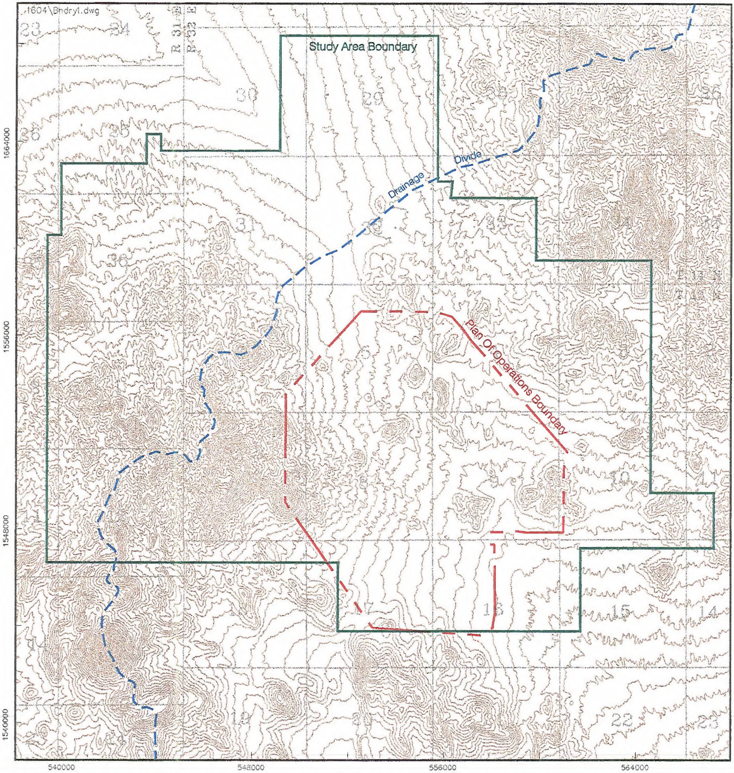
Gold-silver mineralization of the volcanic rocks in the project area was introduced by a silicious hot spring system present 15.7 million years ago (see Chapter 2, Gold and Silver Mineralization). Subsequent erosion has left the resistant silicified hills and rhyolite flow domes exposed above drainages filled with alluvium (Black et al. 1990).

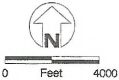
TABLE 3-1
Regional Geologic History of the Denton-Rawhide Mine Project Area

Geologic Time[1]	Geologic Occurrence	Relationship to Mineralization
Paleozoic Era (225-570)	Deposition of marine deep basinal rocks, including carbonate, chert, argillite, and volcanic units.	Oldest exposed rocks in the region.
Paleozoic Era (225-570) Late Devonian and early Mississippian Period (325-360)	Roberts Mountain thrust faulting of Antler Orogeny. Deeper water marine sedimentary rocks (carbonate, chert, argillite, and volcanic units) are pushed eastward along the Roberts Mountain thrust over local shallow marine sedimentary rocks.	Structural compression and thrust faulting in the region.
Late Paleozoic Era to Early Mesozoic Era Permian (280-225) through Triassic (225-190)	Deposition of shelf carbonates and clastic sedimentary rocks. The Golconda thrust system carries basinal and volcanic rocks eastward over shelf to platform carbonate and clastic sedimentary units. Thrust exposed locally and overlain by lower Mesozoic volcanic and clastic units.	Structural compression and thrust faulting in the region.
Mesozoic Era (65-225)	Deposition of marine basinal clastic and volcanic rocks, and continental shelf sediments. Volcanic sediments, northwest-trending faults, oblique-slip and compression structures associated with the Sierra Magmatic Arc west of the Walker Lane. Emplacement of intrusive igneous rocks after faulting.	Deposition of volcanic and sedimentary rocks of the southern Sand Springs Range north of the deposit area. Disrupted zones prepare rocks for intrusions of later volcanic rocks and associated gold mineralization.
Cenozoic Era (0-65) Tertiary Period (3-65)	Extensional tectonics create northwest- and northeast-trending strike-slip, detachment, listric-normal, and high-angle faults. Emplacement of various extrusive rocks, including the Rawhide volcanic center in the Denton-Rawhide Mine project area.	Rawhide volcanic center hosts gold-silver mineralization. Ore deposits occur in pods along northwest-trending zones.
Cenozoic Era (0-65) Quaternary Period (0-3)	Recent localized erosion exposing silicified hills and rhyolite flow domes of project area. Alluvium fills washes. Circulation of groundwater and weathering of rock.	Local erosion and deposition both exposes and masks parts of the mineralized host rocks. Near-surface gold deposits oxidized.

[1] Geologic time presented with names of geologic time periods and approximate millions of years before present in parentheses.

Source: Hardyman and Oldow (1990); Black et al. (1990).





Study Area Boundaries
Denton - Rawhide EIS
Mineral County, Nevada
FIGURE 3-1

STRATIGRAPHY

The oldest rocks exposed near the Denton-Rawhide project area are limestone, shale, and dolomite sequences that probably correlate with the Triassic-age Luning Formation. These rocks, referred to as basement rocks by Gray (1995), occur in the Sand Springs Range north and east of the project area. Drilling around the mine pits in the project area has encountered these older rocks at depths of 120 to 800 feet below the surface layers of the Rawhide volcanic center.

The sequence of rock types in the Rawhide volcanic center is complex and obscured by faulting and hydrothermal alteration. Three main rock units that characterize most of the mine area are: (1) lithic tuff; (2) andesite flows; and (3) stratified tuffaceous sediments and volcanic breccias (**Figures 3-2** and **3-3**).

The lithic tuff is the lowermost exposed unit of the Rawhide volcanic center. It consists of a sequence of ash tuffs and volcanic sedimentary rocks that exceeds 800 feet in thickness. In the area of the Denton-Rawhide deposit, the lithic tuff unit is overlain by an andesite flow unit - the principal host for mineable ore. The andesite flow unit is overlain by a distinctive sequence of stratified tuffaceous sedimentary rocks and interbedded volcanic breccia which appears to be unique to the Denton-Rawhide project area.

STRUCTURE

Within the immediate area of the Denton-Rawhide Mine deposit, three principal structural trends are evident (**Figure 3-3**): (1) north-trending high-angle faults; (2) northeast-striking moderate to high-angle faults; and (3) an inferred northwest structural trend parallel to both the margin of the Rawhide volcanic center and the Walker Lane structural zone (Black et al. 1990).

Structural features within the Rawhide volcanic center provided a plumbing system for magmatic activity, hydrothermal alteration, and migration of mineralizing fluids. Like other metal deposits in the Walker Lane structural zone, ore deposits at the Denton-Rawhide Mine are prevalent along high-angle structures, similar to other metal deposits in the Walker Lane structural zone (Hardyman and Oldow 1990).

MINERALIZATION

Mineable reserves at the Denton-Rawhide Mine are located in four deposit areas: Crazy Hill, Murray Hill, Balloon Hill, and Grutt Hill. These deposits have been or are being mined from two pits: the Crazy Hill pit at the southern end of the mine area, and the Murray Hill pit at the northern end. The Crazy Hill pit is currently being backfilled. The Murray Hill pit is a larger, northwest-trending, elongated pit that provides access to a series of ore zones underlying the Murray, Balloon, and Grutt hills deposits (**Figure 3-3**). The two pits are separated by a relatively narrow area of rock outside the ore zone. The Murray Hill pit would continue to be expanded for the Proposed Action; the Crazy Hill pit, however, is being backfilled and would not be subject to additional mining.

Gold-silver mineralization occurs primarily in wallrocks along the southwest margin of the Balloon Hill rhyolite intrusion, hosted primarily by the andesite flow unit (**Figure 3-3**). Individual ore zones are irregular bodies, typically elongate to the northwest. A distinct ore zone at Crazy Hill is hosted primarily by the siltstone/breccia unit.

Gold occurs as microscopic particles in both iron-oxide and sulfide-bearing rock. Gold-silver alloys are almost exclusively gold within oxide ore, but contain significant silver concentrations in sulfide ore. Silver-bearing minerals contain various types of chlorine, bromine, selenium, sulphur, antimony, copper, and iron. Pyrite is the most common sulfide mineral, with sulfide ore typically containing 1 to 5 percent fine-grained pyrite. Other base-metal sulfides are very uncommon and can only be identified microscopically.

AREA SEISMICITY

The Denton-Rawhide project area is located in the Nevada Seismic Zone, which is based on the aftershock zones of large surface-rupturing historic earthquakes (Algermissen et al. 1982).

Within a 65-mile radius of the project, six large historic earthquakes have been documented with magnitudes ranging from 6.3 to 7.2 (Askew and Algermissen 1983). The closest epicenter of these earthquakes was located approximately 22 miles northwest of the mine site.

The closest historic (post-1872) surface-rupture faulting mapped by Stewart (1980) is located approximately 10 miles northwest of the Denton-Rawhide Mine site and is probably the result of a 1954 earthquake. This earthquake, which had a magnitude of 7.3 (Richter scale), was centered 22 miles northwest of the project area. The fault trends north-south and its trace does not intersect the Denton-Rawhide Mine area.

In a study at the Denton-Rawhide Mine, Gray (1995) concluded that renewed movement has occurred on some of the major faults of the project area since precious-metal mineralization 15 million years ago, and that faulting is probably still active. Alluvial material, assumed to be of Quaternary age, has been offset by these faults.

During design of the Denton-Rawhide Mine project, the potential effect of earthquake shaking on project facilities was assessed. Parameters typically used to characterize seismicity are: (1) magnitude of the controlling earthquake; (2) maximum horizontal acceleration induced in bedrock at the site by the controlling earthquake; and (3) probability of occurrence of the controlling earthquake.

Any disruption to mine facilities from seismic activity would be from liquefaction or surface rupture. Liquefaction occurs when seismic shaking causes earth material to lose its inherent strength and behave as a liquid. In general, liquefaction can occur where earth material is fully water saturated, loose, unconsolidated, and/or sandy. Surface rupture may occur along an active fault undergoing an earthquake.

The maximum predicted earthquake magnitude for the Denton-Rawhide Mine area is 7.3. However, Algermissen et al. (1982) predicted that a magnitude of 6.0 would not be exceeded within the next 50 years because large historical earthquakes had occurred in the region and earthquake stresses had been relieved. The heap leach and waste rock disposal facilities are designed in accordance with NDEP guidelines, with adequate safety factors for potential seismic stress.

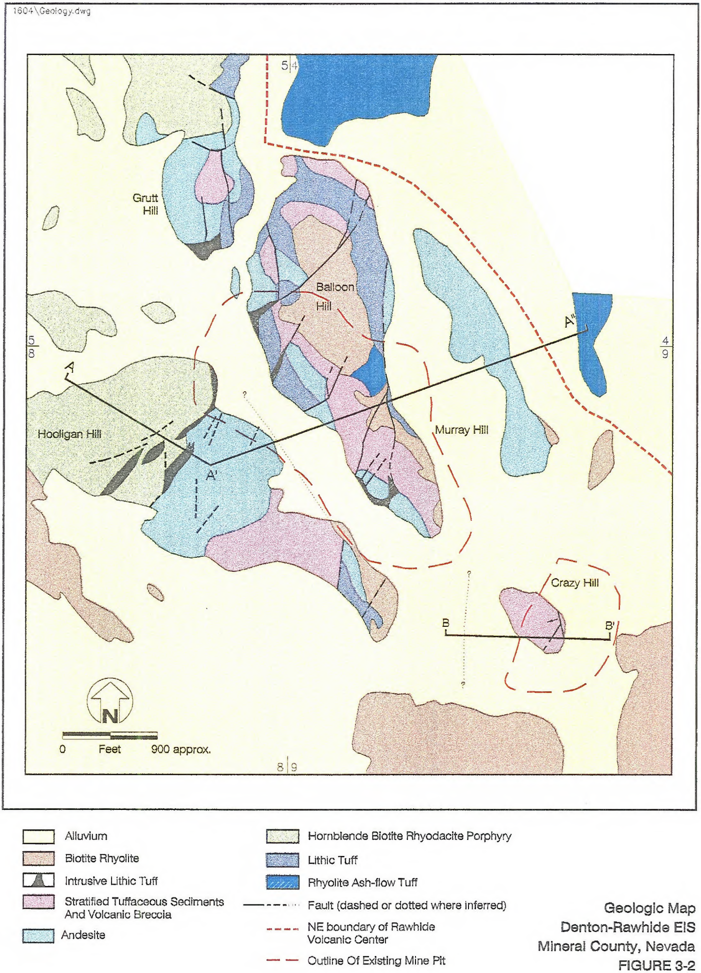
ACID ROCK DRAINAGE

The Denton-Rawhide Mine project has experienced no known incidence of acid rock drainage (ARD). As stated in Chapter 2 under Potentially Acid-Producing Rock, static tests of waste rock material indicate that 8 percent of the waste rock would be potentially acid generating and 92 percent of the waste rock would have a net acid neutralization potential.

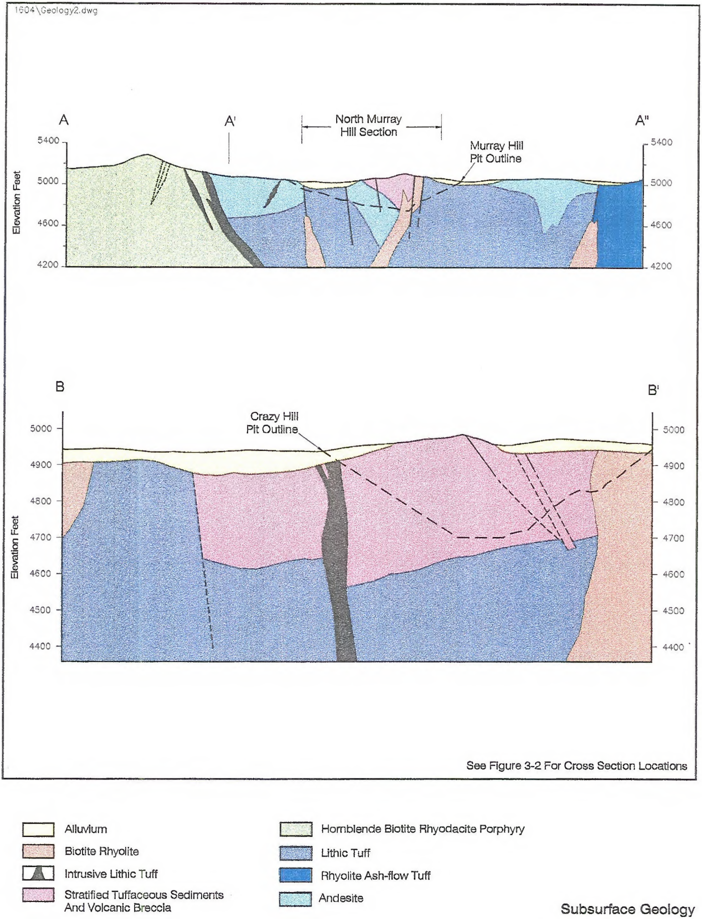
PALEONTOLOGICAL RESOURCES

Paleontological resources in western Nevada consist of vertebrate, invertebrate, and paleobotanical fossils. Rocks in the Denton-Rawhide Mine project area are Tertiary-age volcanic rocks and Tertiary- or Quaternary-age valley-fill deposits, which have little potential for containing paleontological resources. The only other sedimentary rocks exposed near the project area consist of limestone, shale, and dolomite that may correlate to the Triassic-age Luning Formation (Gray 1995). These Triassic-age sediments are exposed in the Sand Springs Range north and east of the project area, and are found at depth east of the Denton-Rawhide Mine open pit.

According to Dr. James Firby (1996), rocks in the Denton-Rawhide Mine project area have a "low potential" for paleontological resources. No fossil-collecting localities were found within the Denton-Rawhide project area during a paleontological survey of the Carson City District for BLM (Firby et al. 1981).



Geologic Map
Denton-Rawhide EIS
Mineral County, Nevada
FIGURE 3-2



Subsurface Geology
Denton-Rawhide EIS
Mineral County, Nevada
FIGURE 3-3

AIR RESOURCES

CLIMATE

The Denton-Rawhide Mine is located in the western portion of the Great Basin Physiographic Province in west-central Nevada. The mine lies in the foothills, pediment slopes, and drainages in the northwestern portion of Gabbs Valley at the southern end of the Sand Springs Range. The climate of the area is best characterized as mid-latitude steppe.

The Gabbs Valley is subject to large daily temperature fluctuations, low relative humidity, and limited cloud cover. The hilly terrain directly affects temperature, precipitation, and wind in the study area. Wind is predominantly from the northwest or north-northwest, but is influenced by daily heating and cooling of the hills and drainage areas. Elevations range from 4,300 to 5,300 feet AMSL. After sunset, cooler mountain air flows downslope across the study area. As the temperatures increase after sunrise, warmer valley air rises upslope until midday, when ground heating causes instability and variable wind directions.

Wind

Annual wind frequency data indicate the most common wind directions are from the north-northwest However, during autumn and winter, southeast winds also occur.

Air Pollution Potential

Factors that directly affect air pollution potential are wind speed, mixing height, and atmospheric stability. Atmospheric stability is a measure of the atmosphere's ability to disperse a pollutant. Unstable atmospheric conditions allow maximum dispersion, whereas stable atmospheric conditions represent minimum dispersion. Mixing height is the atmospheric height to which pollutant concentrations are readily mixed or dispersed.

Mixing heights vary daily and seasonally; they are highest during summer afternoons when solar heating is strongest, and lowest during periods of low wind speeds and temperature inversions. The latter conditions (commonly called stagnation episodes) do not occur frequently over extended periods in Nevada. Temperature inversions occur frequently at night, but they are readily removed by increased wind speeds during the day. The combination of relatively high and persistent wind speeds, unstable atmospheric conditions, and variable mixing heights results in low air pollution potential at the Denton-Rawhide project area.

METEOROLOGY

Temperature

Temperature data for the area are available from the towns of Fallon and Yerington, Nevada; more limited temperature data are available for the Denton-Rawhide Mine (**Table 3-2**). Temperatures in the study area have relatively wide daily and seasonal variability, with daily fluctuations of 30 to 40 degrees Fahrenheit (F) common due to high elevation, proximity to mountains, and limited cloud cover. Temperatures are warmest in July and August, and coldest in January and February. Average annual temperatures for Fallon and Yerington are 51 and 52 degrees F, respectively.

TABLE 3-2
Temperature and Precipitation
Denton-Rawhide Mine Study Area

Mean Monthly Temperature (degrees F)

Station	Elevation in Feet	Jan	Feb	March	April	May	June	July	August	Sept	Oct	Nov	Dec	Annual
Fallon	3,965	31	37	43	49	57	66	72	70	61	51	40	32	51
Yerington	4,380	33	38	44	50	58	66	73	71	63	53	41	33	52
Denton-Rawhide	5,150 b	35	46	43	46	52	63	73	75	70	57	52	39	54

Mean Monthly Precipitation (inches)

Station	Elevation in Feet	Jan	Feb	March	April	May	June	July	August	Sept	Oct	Nov	Dec	Annual
Fallon	3,965	1.31	0.53	0.41	0.55	0.68	0.58	0.21	0.30	0.36	0.43	0.42	0.37	6.15
Yerington	4,380	0.55	0.59	0.44	0.43	0.71	0.52	0.38	0.39	0.29	0.34	0.46	0.42	5.52
Denton-Rawhide	5,150 a	0.11	0.25	0.12	0.98	1.20	0.00	0.15	0.00	0.50	0.72	0.98	0.73	5.74
	b	0.78	1.01	0.47	0.35	4.97	1.64	0.05	0.19	0.18	0.00	0.08	1.48	11.12*

Note:

a - Data for 1994 from on-site monitoring.
b - Data for 1995 from on-site monitoring.
* - higher annual total for 1995 due to anomalous rain events in May and June.
Annual totals for Fallon and Yerington are based on 20-year averages; Denton-Rawhide annual values are single year totals.

Source: NOAA 1993 and KRMC 1996c.

Precipitation

Mean annual precipitation at Fallon and Yerington is 6.15 and 5.52 inches, respectively (**Table 3-2**). Precipitation measured during 1994 and 1995 at the Denton-Rawhide Mine totaled 5.74 and 11.12 inches, respectively (**Table 3-2**). The surrounding monitoring stations show similar trends, with heaviest precipitation occurring from November through January as snow, and during May and June as rain. Summer precipitation, which occurs mostly as scattered showers and thunderstorms, contributes a minor amount to overall precipitation totals.

AIR QUALITY

The Denton-Rawhide Mine is located in Nevada Interstate Air Quality Region #147. Air quality in the study area generally is considered good. The area is designated as unclassified for air pollutants other than 10-micron or smaller (PM-10) particulates due to lack of ambient data on gaseous pollutants (nitrogen oxides, sulfur dioxide, carbon monoxide, and photochemical oxidants). The project area is also designated as a Class II area under the Prevention of Significant Deterioration (PSD) regulations. The PSD Class II designation allows for moderate growth or degradation of air quality within certain limits above baseline air quality. Designation as PSD Class I allows little or no growth or degradation of air quality. The nearest Class I area in Nevada is located approximately 270 miles northeast of the study area (Jarbidge Wilderness).

PM-10 particulates have been measured at the Denton-Rawhide Mine monitoring station for several years. Data from 1994 through first quarter 1996 are summarized in **Table 3-3**. The highest and second highest PM-10 concentrations are within the Nevada and federal 24-hour PM-10 standard concentration of 150 micrograms per cubic meter ($\mu g/m^3$). The maximum annual average PM-10 concentration of 34.3 $\mu g/m^3$ is below the Nevada and federal annual PM-10 standard of 50 $\mu g/m^3$.

Existing mining and ore-processing operations at the Denton-Rawhide Mine are sources for particulate matter and gaseous pollutants. Major sources of total and PM-10 suspended particulates include drilling, blasting, ore and waste removal, hauling, dumping and crushing. Carbon monoxide (CO), nitrogen dioxide (NO_2), and sulfur dioxide (SO_2) are emitted from mining equipment and other vehicles that burn diesel fuel and gasoline. Small amounts of hydrogen cyanide (HCN) are emitted during leaching of ore.

TABLE 3-3
Denton-Rawhide Air Monitoring Data

PM-10 Concentration ($\mu g/m^3$)

	1994	1995*	1996
Maximum	145	88	30
Second Highest	117	88	28
Arithmetic Average	29.1	34.3	17.2
Number of Samples	56	58	14

* PM-10 air sampler was relocated April 4, 1995.
$\mu g/m^3$ = micrograms per cubic meter.

WATER QUANTITY AND QUALITY

SURFACE WATER

The Denton-Rawhide Mine is located within Hydrographic Area No. 122 (Gabbs Valley) as defined by the State of Nevada. The crest of the Sand Springs Range, located approximately 1 mile north of the mine, forms the north surface water drainage divide of Gabbs Valley. Drainage on the south side of the mountains, which includes the Denton-Rawhide Mine project area, is to the Gabbs Valley (**Figure 3-1**). All drainages in this hydrographic area, including the project site, are ephemeral (i.e., flowing only in response to significant rainfall events and/or snowmelt runoff).

Walker River and Carson River basins are the nearest perennial (i.e., flowing year-round) surface water systems to the project site (located approximately 22 miles west and 25 miles northwest of the Denton-Rawhide Mine project area, respectively). Both river systems originate in the Sierra-Nevada Mountains along the Nevada-California border. The Gills Range physically separates the Walker River watershed, including Walker Lake at its terminus, from the Gabbs Valley. Similarly, the Cocoon Mountains lie directly between the Carson River and the Denton-Rawhide Mine.

Several ephemeral drainages in the Denton-Rawhide Mine project area have been disturbed by existing mine facilities, including mine pits, a waste rock disposal facility, heap leach pads, and ore stockpile facilities. Precipitation data indicate that ephemeral flow in these drainages is most likely to occur during April, May, and June. Much of the rainfall received within the project area likely infiltrates into the relatively thin soil horizon or is lost to evaporation before reaching the Gabbs Valley. No springs or seeps are known to occur in the area of the existing Denton-Rawhide Mine within at least a 6-mile radius.

GROUNDWATER

Groundwater recharge in the general project area occurs from precipitation in the mountainous areas. Two principal groundwater units are present along the southern flanks of the Sand Springs Range and adjacent Gabbs Valley: volcanic bedrock and basin-fill alluvium. The absence of springs/seeps and the considerable depth to groundwater in the project area indicates that the groundwater flow system is not localized, but is characteristic of a regional, deep system.

Over 1,600 exploration borings have been drilled at the Denton-Rawhide Mine to depths of approximately 500 feet with several holes advanced as deep as 2,000 feet. Groundwater was not encountered in any of the drill holes. The scarcity of groundwater at the Denton-Rawhide Mine is a function of relatively low precipitation, high evapotranspiration, and the low permeability of bedrock underlying the project area. These characteristics result in minimal recharge to the groundwater system.

The nearest water wells are owned by KRMC and are located approximately 5 miles southeast of the project area in the Gabbs Valley. Two wells (RAW-1 and RAW-2) provide water for the Denton-Rawhide Mine via a 10-inch-diameter above- and below-ground pipeline. The supply wells are completed in unconsolidated alluvium approximately 500 feet below ground surface. The water level in the wells is approximately 225 feet below ground surface.

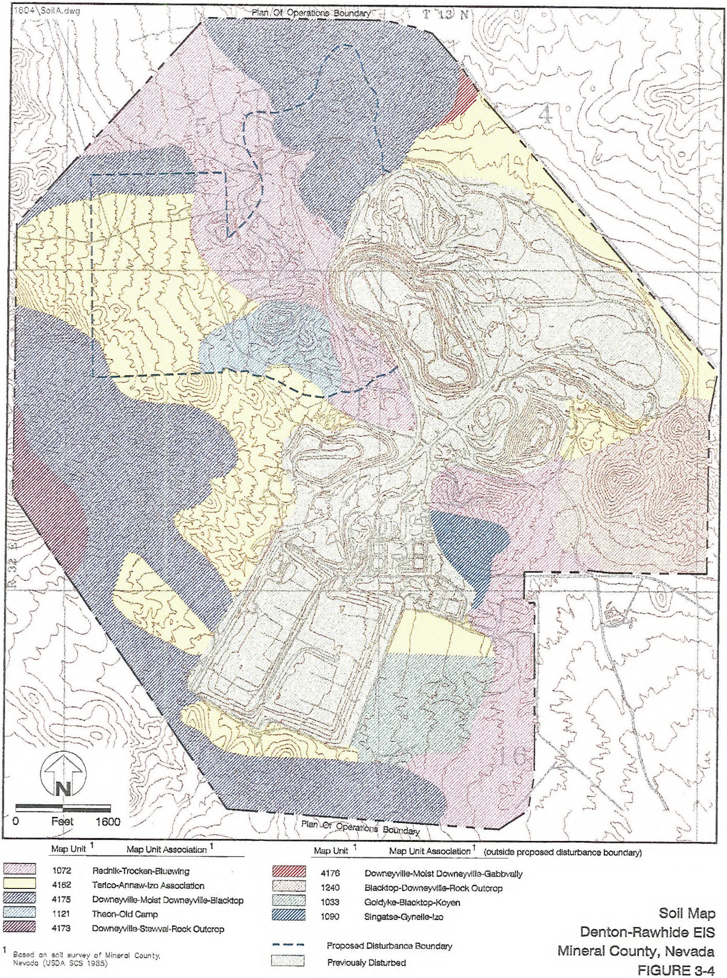
Pumping tests conducted on the supply wells indicate the transmissivity of the alluvial aquifer is about 300,000 to 400,000 gallons per day per foot. A modeling study done to predict groundwater drawdown resulting from pumping the two wells at a combined rate of 1,000 gpm for 10 years (Kiewit Mining and Engineering Co. 1987) indicates the wells will draw down the water table approximately 1 foot at a distance of about 1,500 feet from the wells. Drawdown will be less than 0.5 feet at a distance of 1 mile from the wells.

SOIL RESOURCES

Four soil associations consisting of 11 soil series and numerous minor inclusions have been mapped and described for the Denton-Rawhide Mine expansion **(Figure 3-4)**. Mapping and descriptive data for the associations and soil series were obtained from the Soil Survey of Mineral County Area, Nevada (Soil Conservation Service (SCS), 1985). **Table 3-4** summarizes acreages for each soil association by ownership and proposed disturbance.

Data from the SCS (1985) survey include the following:

- Map unit (association by major and minor series), percent of map unit (comprised by each soil series).
- Taxonomic class, family, parent material, landform, slope.
- Surface characteristics, dominant vegetation, range site, solum depth.
- Permeability, drainage, runoff, erosion hazard, available water capacity.
- Topsoil characteristics.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Plan Of Operations Boundary
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Plan Of Operations Boundary
Map Unit 1 Map Unit Association 1
1072 Rednik-Trocken-Bluewing
4162 Terico-Annaw-Izo Association
4175 Downeyville-Moist Downeyville-Blacktop
1121 Theon-Old Camp
4173 Downeyville-Stewval-Rock Outcrop
Map Unit 1 Map Unit Association 1 (outside proposed disturbance boundary)
4176 Downeyville-Moist Downeyville-Gabbvally
1240 Blacktop-Downeyville-Rock Outcrop
1033 Goldyke-Blacktop-Koyen
1090 Singatse-Gynelle-Izo
Proposed Disturbance Boundary
Previously Disturbed

[1] Based on soil survey of Mineral County, Nevada (USDA SCS 1985)

Soil Map
Denton-Rawhide EIS
Mineral County, Nevada
FIGURE 3-4

TABLE 3-4
Summary of Acres by Soil Map Unit, Ownership, and Proposed Disturbance
Denton-Rawhide Mine

Soil Map Unit[1]	4175		1072		1121		4162		1240	Previously Disturbed			
Ownership	**Public**	**Private**	**Public**	**Private**	**Public**	**Private**	**Public**	**Private**	**Public**	**Private**	**Total Public Acres**	**Total Private Acres**	**Total Acres**
Murray Hill pit expansion	0	76	24	60	10	12	18	0	0	0	52	148	200
ROM leach pad and ponds	15	0	12	1	2	4	55	3	0	0	84	8	92
Diversion ditch	5	0	1	0	0	0	3	3	0	0	9	3	12
Waste rock disposal facility	0	0	0	0	0	0	22	0	12	26	34	26	60
Total	**20**	**76**	**37**	**61**	**12**	**16**	**98**	**6**	**12**	**26**	**179**	**185**	**364**
Total by Map Unit	**96**		**98**		**28**		**104**		**12**	**26**	**179**	**185**	**364**

[1] Map unit association names (SCS 1985):

4175 = Downeyville - moist-Downeyville - Blacktop;
1072 = Rednik - Trocken - Bluewing;
4162 = Terlco - Annaw - Izo;
1121 = Theon - Old Camp.
1240 = Blacktop - Downeyville - Rock Outcrop

Soil in the project area is derived from volcanic materials. The hard parent material and arid climate have resulted in shallow soil with low organic matter and high coarse fragment content. With few exceptions (primarily alluvium), textures are gravelly or stony.

Soil profiles are dominated by coarse fragments that include pebbles, cobbles, and stones. Pebbles (2- to 75-mm diameter) generally make up 25 to 75 percent (by weight) of the surface layer(s). Cobbles (75- to 250-mm diameter) and stones (250- to 600-mm diameter) generally range up to 15 percent (by weight) of the surface layer(s).

Salvageable soil for growth medium at the Denton-Rawhide site would be rated as poor under guidelines in the National Soil Survey Handbook (SCS 1993) numerous rocks and low organic matter content. Soil is moderately to strongly alkaline and is generally non- or slightly sodic. Water erosion potential is slight on level to moderate slopes and severe on steeper slopes. Susceptibility to wind erosion is slight to moderate. **Figure 3-5** shows soil salvage depths in the project area.

Soil is generally not considered suitable for salvage if it has coarse fragments in excess of 75 percent by weight (Ashby et al. 1984). Soil on slopes in excess of 30 percent is excluded due to unsafe conditions for operating equipment. Minimum salvage depth would be 6 inches.

Salvage depths and suitability evaluations of soil in the Denton-Rawhide project area are summarized in **Table 3-5**. The average salvage depth for growth medium is estimated for each series. None of the soil in the project area meets the criteria for "good" or "fair" soil reconstruction material as described in the National Soil Survey Handbook (SCS 1993).

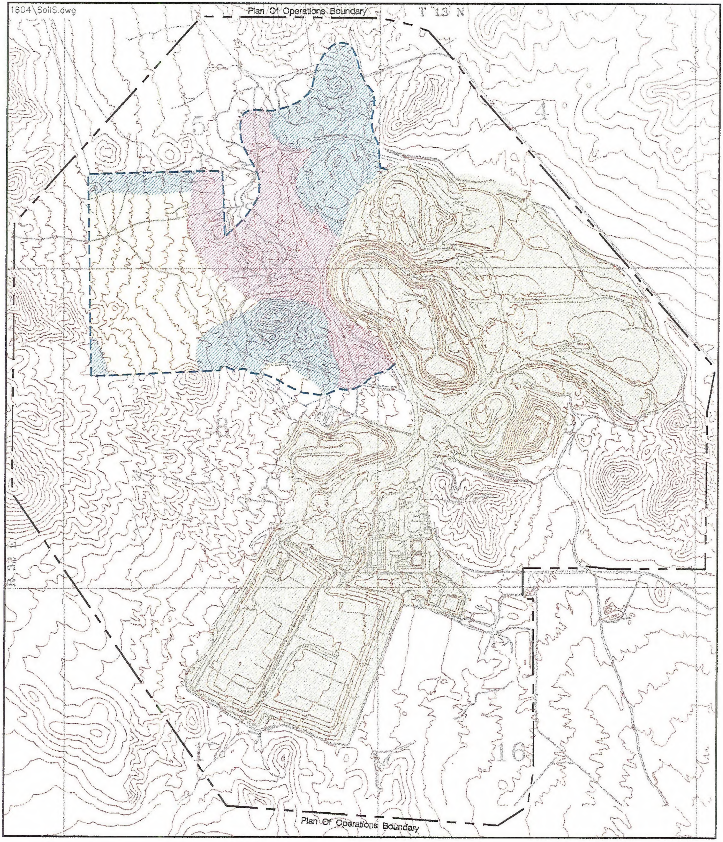
TABLE 3-5
Summary of Soil Suitability Evaluation
Denton-Rawhide Mine Proposed Expansion Area

Map Unit[1]	Map Unit Acres	Series	Percent of Map Unit	Series acres	Salvage Depth - "Poor"[2] (inches)	Salvage Volume -"Poor"[2] (yds^3)	Limiting Factors
4175	96	Downeyville	50	48	0	0	Excess coarse fragments.
		Moist-Downeyville	20	19	0	0	Excess coarse fragments.
		Blacktop	20	19	0	0	Steep slopes.
		Inclusions	10	10	0	0	
1072	98	Rednik	40	39	6	31,462	Excess coarse fragments below 6 inches.
		Trocken	25	25	0	0	Excess coarse fragments.
		Bluewing	20	20	0	0	Excess coarse fragments
		Inclusions	15	14	0	0	
4162	104	Terlco	50	52	17	118,886	Excess coarse fragments below 17 inches.
		Annaw	25	26	13	45,432	Excess coarse fragments below 13 inches.
		Izo	15	16	0	0	Excess coarse fragments.
		Inclusions	10	10	0	0	
1240	12	Blacktoop	40	5	0	0	Steep slopes.
		Downeyville	35	4	0	0	Excessive coarse fragments.
		Inclusions	25	3	0	0	Excessive coarse fragments.
1121	28	Theon	65	18	0	0	Excess coarse fragments.
		Old Camp	20	6	0	0	Excess coarse fragments; steep slopes.
		Inclusions	15	4	0	0	
Potential Volume of Soil to be Salvaged During Proposed Expansion						195,780	
Total Volume of Growth Media Salvaged During Previous Operations						893,700	
Total Volume of Growth Media Available for Reclamation of Current and Planned Disturbances						1,089,480	

[1] Map unit association names (SCS 1985):

4175 = Downeyville - moist-Downeyville - Blacktop association;
1072 = Rednik - Trocken - Bluewing;
4162 = Terlco - Annaw - Izo;
1240 = Blacktop - Downeyville - Rock Outcrop;
1121 = Theon - Old Camp.

[2] Standards listed in Table 620-30, SCS 1993.



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0 Feet 1600

- - - Proposed Disturbance Boundary

▨ Previously Disturbed

	Map Unit	Series	% of Map Unit	Depth of Soil Salvage
▨	1072	Rednik	40	6"
☐	4162	Terlco	50	17"
☐	4162	Annaw	25	13"

▨ No Salvageable Growth Medium

Soil Salvage Depth
Denton-Rawhide EIS
Mineral County, Nevada
FIGURE 3-5

VEGETATION

The Denton-Rawhide Mine site is located in the Tonopah Section of the Great Basin Floristic Division of the Intermountain Region (Cronquist et al. 1972). This area comprises approximately 22,250 square miles of hot desert valleys in southwestern Nevada. Vegetation is generally shrub-dominated with common species including shadscale, big sagebrush, and black sagebrush.

Vegetation surveys were conducted in the Denton-Rawhide study area in June of 1995 (SWCA, Inc. 1995). Data recorded at each plot included vegetation type (based on Cronquist et al. 1972), species composition, elevation, aspect, slope, soil type, and extent of disturbance. Vegetation associations within the study area were described and mapped.

Two vegetation associations were mapped within the study area: Bailey's greasewood/shadscale, and big sagebrush/black sagebrush (**Figure 3-6**). Both of these vegetation associations are common in west-central Nevada, and neither is unique to the study area. Common plant species occurring within these associations are presented in **Table 3-6**. Disturbed areas surrounding road beds, pipelines, old mining operations, and an old railroad grade are generally dominated by weedy species such as tansy mustard, tumble mustard, halogeton, and cheatgrass.

The majority of the area which would be affected by the Proposed Action is within the Bailey's greasewood/shadscale association. This association occurs at elevations of 4,700 to 5,680 feet AMSL in fine-textured, relatively saline soil. Areas below 5,400 feet on gently sloping or relatively flat topography generally have deeper soil (up to 60 inches) and support a denser understory than higher elevations sites with shallower soil. Vegetative cover is generally sparse (10 to 15 percent); vegetative composition by growth form consists of 70 percent shrubs, 25 percent grasses, and 5 percent forbs. Soil erosion potential for this area ranges from slight to moderate.

The big sagebrush/black sagebrush association is found in the western portion of the study area at elevations of 5,480 to 5,790 feet on hills with moderate to steep slopes. The soil in this area is shallow (less than 10 inches), course-textured, and well-drained. In general, big sagebrush dominates sites with deeper soil, while black sagebrush dominates higher elevation sites with shallower soil. Vegetative cover is slightly greater in this association than in the Bailey's greasewood/shadscale association, with values ranging from 15 to 30 percent; vegetative composition by growth form consists of 50 percent shrubs, 40 percent grasses, and 10 percent forbs. Soil erosion potential is slight for this area.

TABLE 3-6
Vegetation Association
Denton-Rawhide Mine

Vegetation Association	Acreage Within Project Area	Common Species
Bailey's greasewood/shadscale	2,474.3	bud sagebrush spiny hopsage Nevada ephedra cheatgrass Indian ricegrass golden princesplume desert mallow
Big sagebrush/black sagebrush	103.3	broom snakeweed Douglas rabbitbrush sheep fescue spike fescue desert needlegrass wild onion rock cress cryptantha

WILDLIFE AND FISHERIES RESOURCES

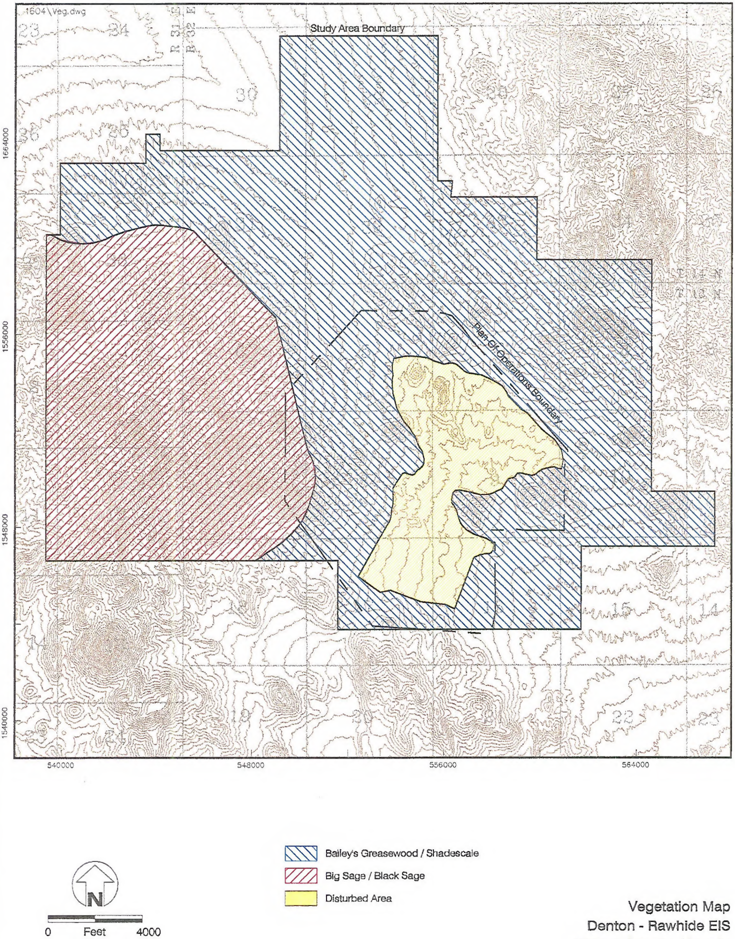
Wildlife diversity within the study area is relatively low as a result of limited habitat diversity and arid climate. Forty-two species of mammals, 57 species of birds, and 17 species of reptiles are known to occur or have the potential to occur in the project area (SWCA, Inc. 1995). Because no surface water or wetlands are found within the project area, there are no fish or wildlife present that are typically restricted to these habitats.

Mammals which could be present in the project area include: mule deer, pronghorn antelope, coyote, kangaroo rat, kangaroo mouse, Townsend's ground squirrel, black-tailed jackrabbit, desert cottontail, whitetail antelope squirrel, and several bat species. Mule deer and desert bighorns are present in small number, in mountainous terrain at upper elevations west of the mine site; however, the project area is not considered important habitat for these species. A herd of 5 to 10 pronghorn antelope utilizes habitat in the Rawhide project area (SWCA, Inc. 1995); however, the project area has not been identified as important habitat for pronghorns.

Bat species observed in the project area include western pipistrel, pallid bat, California or small-footed myotis (identification uncertain), and Townsend's big-eared bat (either Pacific or pale). Suitable habitat also may exist for long-legged myotis, although it has not been observed.

Bats in the project area frequent some abandoned mine adits and shafts and forage for insects near artificial water sources ("guzzlers") constructed for wildlife . Abandoned mine structures and natural caves are sought by many bat species for roosting, raising young (June 1 through August 15), and hibernating during winter. Fourteen bat species may potentially use abandoned mines in western Nevada (Tuttle and Taylor 1994).

Bats utilize abandoned mines for one or more seasonal use periods (i.e., day/night roosts, maternity roosts, winter hibernation) and exhibit strong fidelity to sites year after year (Luce 1993). For many bat species, availability of seasonal roost sites, both natural and man-made, is a limiting factor for population expansion.



Vegetation Map
Denton - Rawhide EIS
Mineral County, Nevada
FIGURE 3-6

Surveys conducted in 1995 (SWCA 1995) indicate that seven shafts and adits in the Denton-Rawhide project area are hibernacula and/or roosts for pallid bats, California myotis or small-footed myotis, western pipistrel, and Townsend's big-eared bats. Abandoned mine adits and shafts with high levels of bat use include the Regent shaft and adit; adit southwest of the Regent adit, adit south of the cemetery, and the Hooligan adit. From 10 to 20 or more California or small-footed myotis were observed in both the Hooligan adit and Regent shaft, indicating the importance of these habitats. A Townsend's big-eared bat was also observed in the Hooligan adit.

Birds observed in the Denton-Rawhide project area include: prairie falcon, red-tailed hawk, chukar, sage sparrow, black-throated sparrow, sage thrasher, black-chinned hummingbird, Say's phoebe, mourning dove, horned lark, raven, rock wren, western bluebird, Brewer's sparrow, house sparrow, and house finch. Although golden eagles have not been observed, they probably utilize the project area for hunting. No raptor nests are known to be present in the project area.

During a winter tour of the mine site, flocks of finches were observed in the vicinity of abandoned shafts and adits. According to Bradley (1993), abandoned shafts and adits in Nevada can be important night roosts for wintering finches and other songbirds. During periods of cold and wind, shafts and adits provide important thermal cover for some species of wintering birds. Although it is not known if shafts and adits in the project area are used as night roosts by wintering songbirds, it is not likely that this occurs.

Reptiles observed in the project area include the zebra-tailed lizard, common collared lizard, long-nosed lizard, sagebrush lizard, side-blotched lizard, desert horned lizard, western whiptail lizard, gopher snake, and western rattlesnake.

THREATENED, ENDANGERED, CANDIDATE, AND BLM SENSITIVE SPECIES

No threatened, endangered, or candidate species are known to inhabit the area that would be affected by the proposed Denton-Rawhide project (Mendoza 1996); however, one species listed under the Endangered Species Act of 1973 (bald eagle - threatened) may occur within or near the project.

As a result of revisions in the status of candidate species, the U.S. Fish and Wildlife Service (USFWS) has reduced the list of candidates for listing under the Endangered Species Act to six species (three plants and three animals). None of these candidates is known to be present in the Denton-Rawhide project area.

The Nevada BLM considers all former candidates to be "BLM sensitive species" and affords them the same protection as candidate species under the Endangered Species Act.

Thirteen Nevada BLM sensitive animal species may occur in the project area (**Table 3-7**). Nevada BLM sensitive species observed during field surveys or for which there may be suitable habitat are pale Townsend's big-eared bat, long-legged myotis, and small-footed myotis. Two Nevada BLM sensitive plant species may also be present in the project area (Nevada orocytes and Nevada dune beardtongue); however, habitat for these species is marginal and they were not found in field surveys (SWCA, Inc. 1995).

TABLE 3-7
Nevada BLM Sensitive Species
Denton-Rawhide Study Area

Species	Status	Potential to Occur in Study Area
Bald Eagle	Threatened	Transitory migrant
Pygmy Rabbit	NV BLM Sensitive	Unlikely, habitat limitations
Spotted Bat	NV BLM Sensitive	Unlikely, habitat limitations
Small-footed Myotis	NV BLM Sensitive	Likely, probably observed in mine adits
Long-eared Myotis	NV BLM Sensitive	Unlikely, habitat limitations
Fringed Myotis	NV BLM Sensitive	Unlikely, habitat limitations
Long-legged Myotis	NV BLM Sensitive	Possible, but not observed
Yuma Myotis	NV BLM Sensitive	Unlikely, habitat limitations
Pale Townsend's Big-eared Bat	NV BLM Sensitive	Likely, probably observed in mine adits
Pacific Western Big-eared Bat	NV BLM Sensitive	Unlikely, habitat limitations
Western Burrowing Owl	NV BLM Sensitive	Possible, but not observed
Black Tern	NV BLM Sensitive	No, wetlands or open water not present
Least Bittern	NV BLM Sensitive	No, wetlands or open water not present
White-faced Ibis	NV BLM Sensitive	No, wetlands or open water not present
Nevada Orocytes (plant)	NV BLM Sensitive	Unlikely, habitat marginal, not observed during field studies
Nevada Dune Beardtongue (plant)	NV BLM Sensitive	Unlikely, habitat marginal, not observed during field studies

BALD EAGLE (THREATENED)

Bald eagles are periodic seasonal migrants and winter residents in Nevada, and may occasionally be present near the project area as transient visitors. Most bald eagles winter in Nevada near open water where fish and waterfowl, their preferred winter prey, are accessible.

PALE TOWNSEND'S BIG-EARED BAT

Pale Townsend's big-eared bats occupy desert areas of the United States in a variety of habitats. They hibernate during winter in caves, mine shafts, adits, and sometimes old buildings. Females with young roost in nursery or maternity colonies during summer. They forage for moths late at night and are rarely observed at dawn or dusk. One Townsend's big-eared bat was observed roosting in the Hooligan adit in June of 1995 (SWCA 1995).

SMALL-FOOTED MYOTIS

This bat is a colonial species nesting in caves, mines, buildings, and trees, usually at elevations below 6,500 feet. Small-footed myotis have been observed in the Independence Mountains (BLM 1996a), the southwestern corner of Mineral County (Hill 1946), and the Talapoosa area (BLM 1996b). Bats thought to be either California or small-footed myotis have been observed in six abandoned mine shafts or adits in the project area (SWCA 1995).

LONG-LEGGED MYOTIS

This bat is a colonial species that roosts in buildings, trees, and rocky crevices. It occurs primarily in pinyon-juniper and conifer forests, where it forages for insects over water and in forest openings. This species has been observed in the Independence Mountains (BLM 1996a), but habitat appears marginal in the project area.

WESTERN BURROWING OWL

Western burrowing owls occur throughout western North America in prairie or desert habitats. They nest in burrows excavated by prairie dogs, ground squirrels, and badgers. These owls also perch on fence posts, rodent mounds or other elevated sites. They prey primarily on insects and small mammals. The shadscale/sagebrush community may provide suitable habitat for burrowing owls in the project area; however, burrowing owls or their signs (e.g., pellets or fecal deposit, "whitewash") were not observed during field studies (SWCA 1995).

RANGE RESOURCES (LIVESTOCK GRAZING)

The Denton-Rawhide Mine is located within the La Beau Flat grazing Allotment #03035. The La Beau Flat Allotment which encompasses 155,923 acres, supports 3,680 animal unit months (AUMs) of grazing. Currently there is one permittee who grazes approximately 647 head of cattle on the allotment from October 25 to April 15. Most grazing occurs north and northwest of the Denton-Rawhide Mine. Forage and water are limited south of the mining operation and cattle rarely utilize this area. Currently there is no specific grazing management method in the La Beau Flat Allotment. Water is moved, via portable troughs, to direct cattle grazing to various parts of the allotment (Irons 1996).

A corral and 8,000-gallon water storage tank are located within the Denton-Rawhide study area. Access to this site is along the county road to Schurz, Nevada. In addition, two portable water troughs are accessed through the study area by way of the county road to Shurz. At this time, no improvements are located within the portion of the study area fenced from cattle use.

RECREATION

Public lands within the Carson City District provide diverse recreational activities, including off highway vehicle use (OHV), sightseeing, wild horse and wild burro viewing, hunting, skiing, photography, rockhounding, and fishing. The area around the Denton-Rawhide Mine site is not intensively used for recreation.

OHV use is dispersed throughout the BLM Carson City District. All land in this district is designated open except for 18 limited or closed areas. Sand Mountain Recreational Area, approximately 20 miles north of the Denton-Rawhide Mine, is the nearest recreational site with 2,096 acres limited to designated routes and 50 acres closed. Public access into and through the Denton-Rawhide Mine area is restricted for safety reasons.

LAND USE AND ACCESS

LAND USE

The Denton-Rawhide Mine is located in Mineral County, Nevada (T13N R32E, Sections 4, 5, 6, 7, 8, 9, 10, 15, 16, 17 and 22). Walker River Indian Reservation is located 4 miles west of the project area. Mineral County is bordered on the north by Churchill County, on the east by Nye County, on the south by Esmeralda County, and on the west by Lyon County and the State of California.

Land use in the vicinity of the Denton-Rawhide Mine includes mining, military use, grazing, and recreation. Mining is the major land use in the project area and will likely remain the principal activity for the next decade.

All mining claims within the project area are controlled by the Denton-Rawhide Mine. All rights-of-way associated with the project for power lines, water lines, telephone lines, and haul roads were included in the original plan of operation.

The Denton-Rawhide Mine is situated on both private and public lands. There are currently 1,005 acres of disturbed land in the project area.

ACCESS

Access to the mine site from the town of Fallon is 32 miles east on State Highway 50 to the junction with SR 839, then 20 miles south. Access from the town of Hawthorne is 40 miles north on SR 839.

AESTHETIC RESOURCES (VISUAL RESOURCES AND NOISE)

VISUAL RESOURCES

The landscape of the study area is characterized by broad, open vistas framed by scattered hills and mountain ranges. The project site is located on hilly terrain between the Sand Springs Mountains and a range of hills that includes Rawhide Peak. To the southeast of the Denton-Rawhide Mine lies Alkali Flat.

Vegetation of the study area consists primarily of homogeneous patterns of Baileys greasewood-shadscale. Natural vegetation patterns are disturbed by active mining operations and reclaimed mining sites. Dominant vegetation colors are gray, gray-green, and yellowish green.

Soil and rock are exposed where vegetation cover is sparse or has been disturbed by mining activities. Soils range in color from chalk off-white to beige. Disturbed soils feature a wider range of colors including dark gray, buff, and chalky white. Color hues of disturbed soils are stronger than those of undisturbed areas. These colors contrast moderately with surrounding soils and vegetation.

The existing mine disturbances (mine pits and waste rock areas) create moderate contrasts with horizontal lines, smooth-surfaced blocky and pyramidal forms, and more vivid colors from disturbed soil and rock. Existing mining facilities adjacent to the Denton-Rawhide Mine create moderate contrasts with forms, lines, and colors of the landscape. This effect is enhanced by the extensiveness of mining operations.

Views of the Denton-Rawhide Mine site are limited due to adjacent hilly terrain. Distant views are limited to areas southeast of the mine. Potential viewers of the project site include mine workers, supply haulers, and recreationists (e.g., hunters and sightseers). The latter would view the project site from SR 839.

Visual Resource Ratings

The BLM has developed the Visual Resource Management System (VRM) to classify visual resources based on scenic quality, visual sensitivity, and visual distance zones. Of the four VRM classes, Class IV allows the greatest modification of the landscape by disturbance or development (BLM 1986a). The project is located in VRM Class IV lands (BLM 1986b). No other VRM classes exist in the project vicinity.

The objective of the Class IV VRM is to provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. The impacts of these activities should be minimized through careful location, minimal disturbance and repetition of the basic elements.

Visual contrast ratings (BLM 1986b) would be established for the Denton-Rawhide Mine based on existing visual characteristics compared with visual characteristics of the Proposed Action. These ratings, which utilize design elements of form, line, color, and texture, are based on the premise that visual quality of a landscape depends on visual contrast created between a project and the existing landscape.

One key observation point (KOP) was selected for evaluating the visual contrast ratings presented in Chapter 4, Visual Resources (**Figure 3-7**). Factors considered in selecting the KOP included angle of observation, number of viewers, duration of view, relative apparent size of the project, season of use, and lighting conditions (BLM 1986b).

This KOP, located along SR 839 connecting Hawthorne and U.S. Highway 50 east of Fallon, represents views seen by supply haulers, mine workers, local residents, and recreationists (**Figure 3-8**). The KOP is slightly lower than the project site and is approximately 2 miles distant. The leach pad is visible in front of Chicago Mountain and adjacent hills. Behind and above the leach pad, the proposed run-of-mill leach pad would be visible. The Murray Hill Pit would not be visible due to hills southeast of the pit. The characteristic landscape is hilly with simple, rounded forms. Exposed soil and rocks are reddish brown to dark gray, with vegetation colors ranging from gray-green and yellowish in the foreground to gray, tan, and buff in the background. Textures are generally stippled and clumped in the foreground, and smooth in the background. Existing mining operations offer weak contrasts in form and color, introducing weak horizontal and diagonal lines and chalky white and beige colors.

NOISE

Because of the remote location of the Denton-Rawhide Mine project area, no measurements or estimates of baseline sound were made at the mine site. The nearest residential areas are Shurz, Hawthorne, and Fallon, located approximately 40 to 55 miles from the mine site.

Noise at the Denton-Rawhide Mine is generated by blasting, crushing, ore handling, and vehicle and heavy equipment operation. Noise generated by mining operations is audible at the mine site. Noise from trucks, bulldozers, and other equipment generally ranges from 90 to 100 dBA (A-weighted decibel sound scale) at the source. Sound levels from blasting range from 100 to 125 dBA at 900 feet.

CULTURAL RESOURCES

Cultural resources include archaeological, historical, and architectural sites and artifacts that allow a better understanding of the lifestyles of early societies. Although all cultural resources provide information collectively on the past, some sites contain information for research, public interpretation, and use by future generations. Cultural resources are locations of past human activity defined by clusters of features and artifacts. These resources are recorded as sites, as loci within and contributing to sites, or as isolates/isolated finds. Surveys in the Denton-Rawhide Mine area have recorded 62 historic sites, four combination prehistoric/historic sites, and 213 isolates. The townsite of Rawhide (CrNv-03-2162) also contains 114 historic and prehistoric loci. Most of the historic sites, isolates, and loci directly relate to historic mining activities.

Detailed prehistoric, ethnographic, and historic overviews and cultural resource inventories of the Denton-Rawhide Mine area have been conducted by Hatoff and Moore (1986), Reno and Palmer (1992), Morris and Mehls (1994) and Terzis et al. (1996). The cultural history section that follows has been taken primarily from Fredlund (1996) and the Rawhide history from Reno and Palmer (1992). Consultation with Native Americans regarding their concerns on the project area was initiated by the BLM-Carson City District.

CULTURAL HISTORY

Evidence from the Pre-Archaic Period (8,000 to 5,000 B.C.) reveals Great Basin groups using Plains-style projectile points as well as stemmed points of the Western Stemmed Tradition (Bryan 1980). Subsistence seems to have been based on the hunting of large game, but the presence of Pre-Archaic materials near marshlands suggests that some groups may have collected plant foods and hunted smaller animals. Tool types recovered include chipped stone choppers, scrapers, and stone crescents. Few ground stone artifacts, considered the hallmark of plant processing, have been found. Elston (1986) suggests people lived in small, family-based and highly mobile groups.

The Archaic Period is divided by Elston (1986) into three parts: Early Archaic (5000 B.C. to 2000 B.C.), Middle Archaic (2000 B.C. to A.D. 500), and Late Archaic (A.D. 500 to the introduction of Numic speaking groups). Archeological evidence for the Archaic Period has been recovered from numerous surface sites and from excavated caves and rock shelters throughout the Great Basin and around the project area.

The Early Archaic represented a change from the cooler, wetter climate of the Pre-Archaic to the drier climate of today. The appearance of heavy ground stone tools indicates a shift in the economy from large game to plant processing. The period is also distinguished by the presence of Pinto series projectile points.

Relatively cool and moist, the Middle Archaic was a time of expansion and diversification of cultural groups. The archaeological record is characterized by the use of Elko Series projectile points, milling stones, and reliance on smaller fauna such as rabbits.

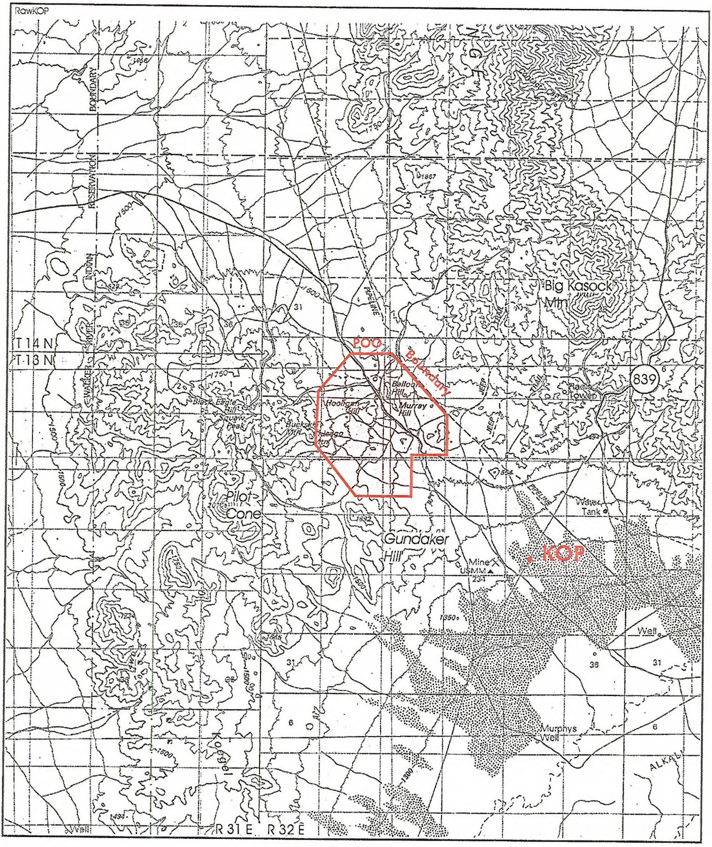
These general trends continued until the Late Archaic when a significant technological change occurred -- the use of bow and arrow. Projectile points attributed to this period are smaller than previous points. Another technological breakthrough was the use of ceramics, around 1100 A.D.

Based on linguistic evidence, Numic-speaking peoples probably moved into the area from the southwestern Great Basin around A.D. 1300 (Elston 1986). The settlement and subsistence pattern involved seasonal movement between different vegetation zones and use of a wide variety of foods. The size and structure of groups fluctuated with availability and abundance of food as well as with season.

Historic Period

The mining boom at Rawhide, Mineral County, Nevada began on Christmas Day, 1906, when prospector Jim Swanson staked the Poor Boy, the first claim in the area (Shamberger 1970:2). No further action occurred until Z.T. Carson began staking claims in the area in February 1907. In the next three days, Carson along with five other prospectors filled a triangle of land formed by three hills with mining claims; these hills came to be called Hooligan Hill, Grutt Hill, and Balloon Hill on February 15. C.C. Dunning filed on the first placer gold and staked the first claims on Murray Hill. By September 30, 1907, two of the original claim holders sold out to R.M. Van Dorn and Associates.

The town of Rawhide developed in the valley between several mineralized hills along the old Wadsworth-Candelaria stage route. The population grew from a few hundred in the early fall of 1907 to 3,000 - 5,000 at the end of the year. The town's rapid growth occurred despite the fact that Rawhide had no water source -- the liquid was hauled in daily via mule-drawn wagons from Deadhorse Well 8 miles to the south and from Schurz 27 miles to the west (Shamberger 1970:13). Rawhide's boom reached its height in April 1980, the town had three banks, two water companies, three weekly and two daily newspapers, 12 hotels, two dance halls, and 12 churches. Vices, however, were the main business of the town with 90 saloons and approximately 300 houses of prostitution. On September 4, 1908, a fire broke out that



From USGS 30x60 Fallon Quad

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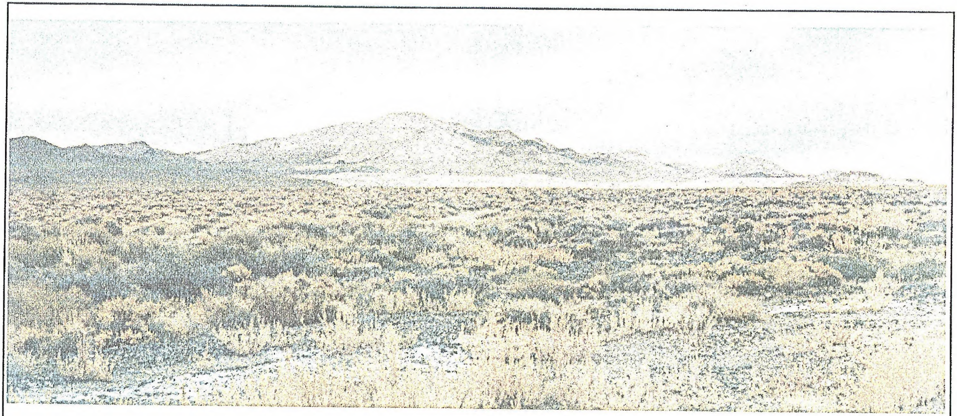
POO = Plan Of Operations
VRM = Visual Resource Management
KOP = Key Observation Point

VRM Class Boundary and KOP Location
Denton-Rawhide EIS
Mineral County, Nevada
FIGURE 3-7



Existing

Existing Conditions From KOP
Denton-Rawhide EIS
Mineral County, Nevada
FIGURE 3-8

destroyed most of the downtown (Shamberger 1970:15; Elliott 1966:95). While the town was partially rebuilt, it never again reached prior glory (Elliott 1966:95; Mordy and McCaughey 1968:135; Shamberger 1970:8).

Rawhide and the Regent Mining District are not currently listed on the National Register of Historic Places. The area's historic significance lies in its distinction as a primary early twentieth century mining boosterism and speculation site, its boom phase during a national economic panic, and the continuance of dry wash placering production.

CULTURAL RESOURCE SURVEYS IN THE AREA OF POTENTIAL EFFECT

Several cultural resource inventories have been conducted in the area of potential effect (or Plan of Operations area, **Figure 3-9**) in compliance with regulations established in the 1966 National Historic Preservation Act (NHPA), 36 CFR Part 800 (**Table 3-8**). Four combination prehistoric/historic sites and 62 historic sites have been recorded within the project area; additionally, 104 historic loci and two prehistoric loci have been identified as part of the Rawhide townsite.

Hatoff and Moore (1986) conducted a Class II reconnaissance of a 1,300-acre area encompassing proposed mine developments. This effort included walking surveys, windshield surveys, and spot checks of the townsite of Rawhide. The town of Rawhide was not recommended as eligible for the NRHP because of lack of integrity. No prehistoric sites or locci were recorded.

Reno and Palmer (1992) completed a Class III inventory of proposed drill hole locations and the access road on Hooligan Hill west of the historic business district of Rawhide. Within a 100-acre parcel on the east side of Hooligan Hill, 23 acres were inventoried. No new historic sites were recorded. Thirteen small historic loci and two prehistoric loci were recorded as components of the previously identified Rawhide cultural site. Morris and Mehls (1994) completed a 400-acre Class III inventory of two parcels that were also within the Rawhide cultural site. No new historic sites were recorded. However, 91 historic loci were recorded as part of the Rawhide cultural site.

TABLE 3-8
Previous Archaeological Investigations Within Approximately 1 Mile of the Area of the Proposed Action

BLM Report	Report Title	Reference	No. of Sites and Isolates within 1-Mile Buffer	No. of Eligible Sites within 1-Mile Buffer	Sites in Area of Potential Effect	NRHP-Eligible Sites in Area of Potential Effect
BLM CR-3-1070(P)	Rawhide Mining Project	Hatoff and Moore (1986)	1 site, hist.	none	1 site CrNV-03-2162	none
BLM CR-3-1490 (P)	CRI of Drill Pads and Access Roads at Rawhide	Reno and Palmer (1992)	1 site* 13 - hist. 2 loci - prehist.	none	1 site* CrNv-03-2162	none
BLM CR-3-1601(P)	A Class III CRI of the Rawhide Project	Morris and Mehls (1994)	1 site* 91 loci - hist.	none	1 site* CrNv-03-2162	none
BLM CR-3-1721	A Class III CRI of approx. 1,300 acres in the Regent Mining Dist.	Terzis, Goodman and Palmer (1996)	12 sites**	none	none	none

* This survey is within the boundaries of the previously recorded historic site of Rawhide.

** Only sites recorded in the southern leg of the survey were considered to be within the 1 mile buffer zone.

Terzis et al. (1996) conducted a Class III inventory of a 1,300-acre area northwest of the townsite of Rawhide. This survey encompassed 1,300 acres but only the southern end of the survey area is within the 1-mile buffer zone around the area of potential effect. The survey identified 65 cultural sites (61 historic and 4 historic/prehistoric) and 213 isolates. While six sites are potentially eligible for the NRHP, none is within the 1-mile buffer zone around the area of potential effect.

Prehistoric Documentation

No prehistoric sites have been recorded in the project area. Four combination historic/prehistoric sites have been recorded to the north, outside of the project area and the buffer area. Two prehistoric loci were recorded as part of the Rawhide cultural site.

Historic Documentation

The townsite of Rawhide has been recorded as a cultural site, (including 114 loci), but the mining camp has little remaining integrity. These loci are composed primarily of prospect pits, platforms, and trash scatters. Recent (within the last 50 years) mining and mineral exploration has been conducted around Rawhide, but this activity and its associated artifacts are not considered historic.

NATIVE AMERICAN RELIGIOUS CONCERNS

The proposed Denton-Rawhide Mine project area and its surrounding cumulative effects area are within or adjacent to the traditional homeland of the Walker Lake Paiute and the Fallon Paiute-Shoshone (Northern Shoshone).

CONSULTATION

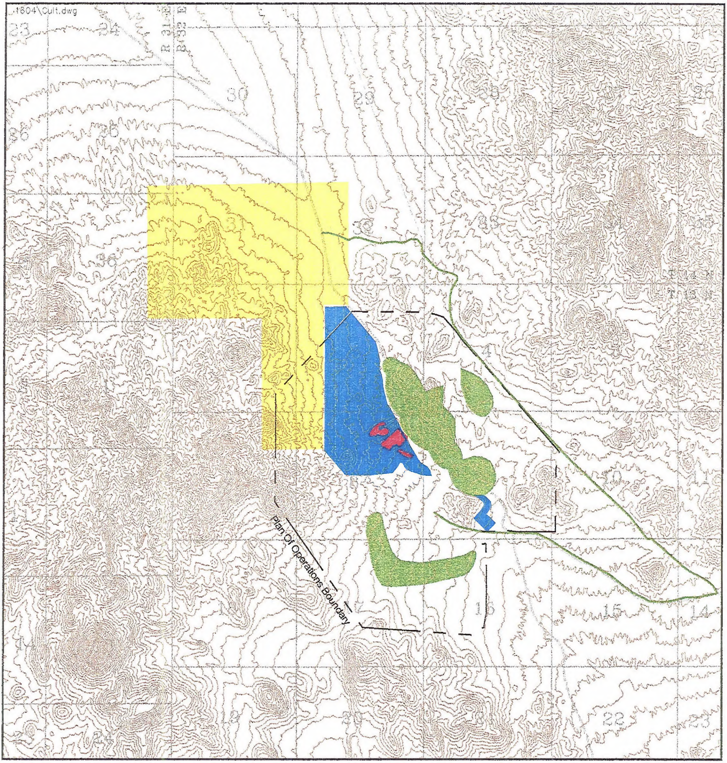
This document was prepared and the consultation process was conducted in accordance with the National Historic Preservation Act (NHPA), the American Indian Religious Freedom Act (AIRFA), and the Native American Graves Protection and Repatriation Act (NAGPRA).

The BLM has contacted three tribal groups regarding ethnography. Native American groups were represented by individuals in Yerington, Fallon, and Schurz. None of these groups has responded with comments regarding the Proposed Action. According to BLM personnel, Pilot Cone (a landmark 3 miles southwest of the project area) may be of cultural significance to Native American groups.

Native Americans with the closest ties to the project area are likely to reside on the Walker Indian Reservation immediately to the west; on the Northern Paiute reservations at Nixon and Fallon; at the joint Northern Paiute and Washoe Indian Colony in Reno-Sparks; and on the Washoe reservations in Gardnerville and Carson City. A few other Native American individuals and families who live near the proposed project area may also have concerns.

SOCIAL AND ECONOMIC RESOURCES

The socioeconomic study area includes Mineral County (the county in which the mine is located), Churchill County (the county in which most mine employees live), the unincorporated town of Hawthorne, the city of Fallon, and the Walker River Indian Reservation. A socioeconomic technical report describing socioeconomic conditions of the study area in more detail is on file at the BLM office (Northwest Resource Consultants (NRC) 1996).



BLM Report Number	Reference
🟩 BLM CR-3-1070 (P)	Hatoff & Moore 1986
🟥 BLM CR-3-1490 (P)	Reno & Palmer 1992
🟦 BLM CR-3-1601 (P)	Morris & Mehls (WCRM) 1994
🟨 BLM CR-3-1721	Terzis, Goodman & Palmer (SWCA) 1996

N

0 Feet 4000

Cultural Resource Surveys
Denton - Rawhide EIS
Mineral County, Nevada
FIGURE 3-9

SOCIAL LIFE

Created in 1911, Mineral County was named for its rich deposits of gold, silver, copper, tungsten, iron, coal, borax, lead, and gemstone rocks (Sierra Pacific Power Company 1995a). The indigenous inhabitants of Mineral County were primarily hunters and gatherers of the nomadic Northern Paiute Tribe. After the Pyramid Lake War of 1860, the Paiutes were placed on a reservation near Walker Lake named the Walker River Indian Reservation (Ellen and Glass 1983). Schurz is the tribal headquarters and major trade center on the Reservation.

Hawthorne is the largest town and center of commerce in Mineral County (Ellen and Glass 1983; Castleman 1991). The ammunition depot in Hawthorne plays an important economic role in the area; however, Hawthorne has focused on expansion of its services to attract travelers into the small town and promote a more stabilized local economy and permanent population (Castleman 1991). Mining also continues to be a thriving industry in the area with three active mining operations (Nevada Commission on Economic Development no date).

Churchill County, located in the high desert of Nevada, was established in 1861. In 1903, the National Reclamation Act was passed by Congress which provided federal funding for the Lahontan Dam. The dam provided and continues to offer irrigation and recreational opportunities in the area (Greater Fallon Area Chamber of Commerce no date). Today, farming and ranching are a vital part of the area's economy and character.

Fallon, the major trade center of Churchill County, is home to the $55 million Top Gun School. The School opened in mid-1996, adding an estimated 100 military positions which could create approximately 284 jobs within Fallon (Lahontan Valley News and Fallon Eagle Standard 1994; Lahontan Valley News and Fallon Eagle Standard 1996a).

POPULATION TRENDS AND DEMOGRAPHIC CHARACTERISTICS

Mineral County's population increased by 4.1 percent between 1980-90, increasing from 6,217 in 1980 to 6,475 in 1990. The 1996 estimated population of Mineral County is 6,539, approximately 1 percent higher than the 1990 population (Nevada State Demographer 1996). Mineral County was forecasted to start a downward trend in population, decreasing to an estimated 5,232 people by 2016 (Nevada State Demographer 1996). Between 1980-90, the town of Hawthorne increased by 11.3 percent to 4,162.

The population of Churchill County experienced a 28.9 percent increase between 1980 and 1990, rising from 13,917 in 1980 to 17,938 in 1990. In 1996, the estimated population of Churchill County was 22,269 -- 24.1 percent more than the 1990 population (Nevada State Demographer 1996). Churchill County is forecasted to grow to an estimated population of 56,207 by 2016 (Nevada State Demographer 1996). The population of Fallon grew at an even faster pace than the county, increasing 51.1 percent between 1980 and 1990 to a population of 6,438 (Nevada Department of Administration 1995).

The population within and adjacent to the Walker River Indian Reservation in 1993 was 941, 11 percent over the 1991 population of 850 (Bureau of Indian Affairs 1993 and no date).

COMMUNITY SERVICE PROVIDERS

Education

The three elementary schools in Mineral County School District, serving students enrolled in kindergarten through grade 8. These schools are Hawthorne Elementary in Hawthorne, Mina Elementary in Mina, and Schurz Elementary on the Walker River Indian Reservation. Mineral County High School in Hawthorne includes students in grades 9 through 12. Schools within the school district are operating below capacity;

however, modular classroom units are used at Babbitt Elementary and Schurz Elementary schools. The school district plans to construct additional elementary school facilities in Hawthorne and Schurz. No grades exceed the number of students per teacher ratio recommended by the State of Nevada (Mineral County School District 1996).

All schools within the Churchill County School District are located in Fallon. Four elementary schools provide education to students in kindergarten through grade 6. These schools are E.C. Best Elementary, Lahontan Elementary, Northside Elementary, and West End Elementary. Cottage Elementary School is a special education school for children between the ages of 3 and 5. Churchill County Junior High School serves students in grades 7 and 8, while Churchill County High School provides education to students in grades 9 through 12. Schools within the school district are currently operating at or over enrollment capacity; however, no grades exceed the student/teacher ratio recommended by the State of Nevada and the school district employs an adequate number of teaching staff to provide students with the quality of education expected by the community (Flores 1996). Modular classrooms are used at Northside Elementary, E.C. Best Elementary, and West End Elementary schools. An elementary school (Numa Elementary) is being constructed and major additions will be made to the existing junior high and high school.

Law Enforcement

The Nevada Highway Patrol, Mineral County Sheriff's Department, Churchill County Sheriff's Department, Fallon City Police, and Walker River Reservation Tribal Police provide law enforcement services in the study area. The Highway Patrol is responsible for law enforcement activities on state highway systems; the Mineral County Sheriff's Department is accountable for Mineral County including five communities and the Walker River Indian Reservation (4,019 square miles); the Churchill County Sheriff's Department is responsible for Churchill County and the communities within the county (approximately 5,000 square miles); the Fallon City Police are restricted to the Fallon city limits (4.5 square miles); and the Walker River Tribal Police are accountable for law enforcement on the Reservation. Most frequently committed crimes in the study area include domestic violence and property crimes (McKellip 1996; Ingram 1996; Phipps 1996). The Mineral County Jail is located in Hawthorne and the Churchill County Jail is situated in Fallon.

Fire Protection

Fire protection in Hawthorne is provided by the Hawthorne Volunteer Fire Department and in Fallon by the Fallon/Churchill County Fire Department. The Hawthorne Volunteer Fire Department and the combined Fallon/Churchill County fire departments have a sufficient number of firefighters, equipment, and vehicles to meet the fire protection needs in their service area (St. Clair 1996; Allison 1996).

Ambulance Services

Two ambulance departments provide emergency health-care services in the study area--Mineral County/Hawthorne Volunteer Ambulance Service in Hawthorne and Churchill Community Hospital Ambulance Service in Fallon. Both ambulance services have an adequate number of volunteers, equipment, and vehicles to meet the health-care emergency demands in their respective service areas (St. Clair 1996; Schwall 1996). Two helipads are located at the Churchill Community Hospital, but no fixed-wing ambulance aircraft are available.

Health Care

Mount Grant General Hospital in Hawthorne with 35-beds is adequate to meet the community's health-care needs. Other medical resources in Hawthorne include a medical clinic, a dentist, a Public Health Service Office, and a Rural Health Clinic Acute Care Office (Sierra Pacific Power Company 1995a).

The Schurz Hospital on the Walker River Reservation provides medical, pediatric, and obstetrical services to approximately 15,096 Indian people residing in the Schurz Indian Health Service Unit. Contract hospital services also are provided for Reservation residents at Washoe Medical Center in Reno and Churchill Community Hospital in Fallon (Bureau of Indian Affairs 1996).

The new 40-bed Churchill Community Hospital in Fallon opened in July 1996. The Physicians Center and Physicians Center West in Fallon, under the auspices of the Churchill Community Hospital, offer health-care services in cardiology, gastroenterology, neurology, orthopedics/spine institute, and urology (Churchill Community Hospital no date). Other health care services in Fallon include two medical clinics, nine dentists/orthodontists, three chiropractors, and three optometrists (Sierra Pacific Power Company 1995b).

Water Supply

Hawthorne city water is obtained from wells and water is stored in four storage tanks. The system and storage tanks are in good working condition and are operating below designed capacity (Abrams 1996).

Four wells and two storage tanks provide the city of Fallon with its public water supply. The system is operating below its designed maximum flow capacity of 6.5 millions gallons per day (mgpd), and is in good working condition (White 1996).

Wastewater Treatment Facilities

The Hawthorne wastewater treatment facility is an aerated facultative lagoon system with two primary ponds for treatment. Operating below its designed capacity (0.7 mgpd), the system currently serves an estimated 4,000 people and is in good working condition (Abrams 1996).

The Fallon wastewater treatment facility consists of an aerated lagoon system with an Imhoff tank. Approximately 7,100 people currently are served by the system. The system is in good working condition, but operating close to designed capacity of 1.2 mgpd. An expansion of the wastewater treatment system is being designed (White 1996).

Solid Waste

Three landfills in Mineral County are located in the towns of Hawthorne, Mina, and Luning. With improvements now in progress, the Hawthorne landfill, has an estimated 50 years of useful life remaining (Abrams 1996). The Mina and Luning landfills must be closed by late 1997, and will be replaced by a transfer station midway between the towns where garbage will be collected and hauled to the Hawthorne landfill (Mineral County Independent-News 1996a).

Churchill County currently has no landfills; however, a city/county landfill is scheduled to be opened in late 1997 (White 1996). Currently an estimated 50 tons of solid waste are collected each day and transported to the Lockwood landfill for disposal (Lahontan Valley News and Fallon Eagle Standard 1996b).

Housing

In 1990, there were 1,858 housing units in the town of Hawthorne, of which 1,663 were occupied. Of the 1,663 occupied housing units, 69.8 percent were owner occupied and 30.2 percent were renter occupied (U.S. Bureau of the Census no date-a). The purchase price of a typical 1,150-square-foot, single-family home in the Hawthorne area is $65,000 and the average rent of a two-bedroom apartment in a multi-family dwelling is about $350 per month (Sierra Pacific Power Company 1995a).

Ninety-five percent of the 2,763 housing units in the city of Fallon were occupied in 1990. Of the 2,620 occupied units, 48 percent were owner occupied and 52 percent were renter occupied (U.S. Bureau of the Census no date-b). The cost of purchasing a typical 2,000-square-foot, single-family dwelling in the Fallon area is between $95,000 and $110,000, while the average rent of a two-bedroom apartment in a multi-family complex is approximately $500 a month (Sierra Pacific Power Company 1995b).

The Walker River Indian Reservation had a total of 283 housing units in 1990 of which 84 percent were occupied. Seventy-nine percent of the units were owner occupied, while the remaining 21 percent were renter occupied (U.S. Bureau of the Census no date-c).

In 1995, there were five mobile home parks in Hawthorne with 82 trailer spaces. Fifty-eight percent of the 82 spaces were occupied, 26 percent were vacant, and 16 percent of the spaces were owned by the parks. There were 692 mobile home spaces in the 22 mobile home parks in Fallon, with 81.1 percent occupied, 7.2 percent vacant, and 11.7 percent owned spaces (Nevada Department of Commerce 1995).

Government and Public Finance

Total assessed valuation of property and net proceeds of mineral tax for Mineral and Churchill counties for fiscal year (FY) 1994-95 were $143,711,330 and $335,837,494, respectively. In Mineral County, $123,711,330 of the total assessed valuation of property and net proceeds of mineral tax amount was attributable to the net proceeds of minerals tax and $20,000,000 was property tax. In Churchill County, $301,837,434 of the total assessed valuation was attributable to net proceeds of minerals tax and $34,000,000 was property tax. The actual net proceeds of mineral tax collected by the county for Mineral County was $417,134, and by Churchill County, $100,816 (Ambrose 1996; Kalt 1996).

The biggest share of FY 1994-95 revenue for Mineral County, 50.2 percent, came from intergovernmental transfers from federal, state, and local sources. Property taxes provided 33.5 percent of Mineral County revenue, followed by charges for services (7.5 percent), miscellaneous revenue (3.8 percent), fines and forfeitures (2.8 percent), and licenses and permits (2.1 percent). The majority of the expenditures were for public safety (32.1 percent), general government (30.4 percent), and highways and streets (10.7 percent). Revenue exceeded expenditures in FY 1994-95 by $222,469 (Nevada Department of Taxation, 1996a).

Approximately 56 percent of Churchill County revenue was derived from intergovernmental transfers in FY 1994-95, followed by property taxes (28.1 percent) and miscellaneous revenue (6.3 percent). The largest expenditures were for general government (26.1 percent), public safety (23.8 percent), and highways and streets (15.5 percent). Expenditures exceeded revenue by $1,454,294 in FY 1994-95 (Nevada Department of Taxation, 1996b).

Licenses and permits accounted for the largest share of revenue of the town of Hawthorne (53.0 percent) and intergovernmental transfers was the biggest source of revenue for the city of Fallon (43.0 percent) in FY 1994-95. Public safety was the highest expenditure for both city governments. In Hawthorne, expenditures exceeded revenue by $49,103, and in Fallon, expenditures exceeded revenue by $43,368 (Nevada Department of Taxation, 1996c and 1996d).

Employment

In 1994, 15 percent of the 2,548 workers in Mineral County were employed in mining. Miners in Mineral County made up 3 percent of the state's employment in mining in 1994. In Churchill County, 4 percent of the workers were employed in mining; these workers constituted less than 1 percent of the state's mining employment (Nevada Department of Employment no date-a). It should be noted, however, the Nevada Department of Employment numbers represent where jobs are located and not necessarily where employees live. For example, most of the Kennecott Denton-Rawhide workers commute to Mineral County for work at the mine, but reside in Churchill County.

In 1994, the largest employment sector in Mineral County was the services industry, employing 49 percent of the county's workers, followed by the government sector (21.7 percent) and mining industry (14.8 percent). Major employers with 100 or more employees in the county were: Day

Zimmerman & Hawthorne Corporation (600 employees), El Capitan Lodge and Casino (190 employees), Mineral County School District (175 employees), Mineral County (135 employees), and Brown and Root USA, Inc. (100 employees) (Nevada Commission on Economic Development 1995). In 1994, the unemployment rate for Mineral County was 7.5 percent, lower than the 1993 rate of 9.6 percent, but higher than the state 1994 unemployment rate of 5.4 percent (Nevada Department of Employment no date-b).

The major employment sector in Churchill County was the services industry in 1994 (35 percent), followed by the government (27.2 percent) and wholesale and retail trade (19.9 percent) sectors (Nevada Department of Employment no date-a). In FY 1994-95, the 10 largest employers in Churchill County were: Naval Air Base (2,324 employees), Churchill County School District (500 employees), Churchill County including telephone company (254 employees), Churchill Community Hospital (250 employees), Stockman's Restaurant and Casino (170 employees), Nugget/Bonanza Casino Hotel (164 employees), Kennametal, Inc. (150 employees), Fallon Convalescent Center (127 employees), Raley's (120 employees), and Nevada State Employees (119 employees) (Churchill Economic Development Authority no date). Churchill County's 1994 unemployment rate was 6.9 percent, lower than the 1993 rate of 8.1 percent, but higher than the 1994 state rate of 5.4 percent (Nevada Department of Employment no date-b).

In 1995, the Denton-Rawhide Mine in Mineral County employed 173 workers. Most of the workers (69.3 percent) resided in Fallon (Churchill County), while 24.7 percent lived in Hawthorne (Mineral County). The remaining 6 percent of the mine employees resided in Yerington, Schurz, Luning, Gabbs, and Reno (Deines 1996).

No industries operate on the Walker River Indian Reservation and employment opportunities are primarily seasonal construction jobs. Economic development on the reservation is a priority of the Tribe's, with agricultural development as the economic impetus. Based on a potential labor force of 399 and 154 being unemployed, the estimated 1993 unemployment rate on the Reservation was 38 percent (Bureau of Indian Affairs 1993).

Income

Per capita personal income in Nevada in 1993 was $22,894, compared with $19,473 for Mineral County and $17,728 for Churchill County (Bureau of Economic Analysis 1995). In 1994, the annual average wage of people working directly in the mining industry was $44,902 for Nevada, $43,892 in Mineral County, and $24,170 in Churchill County. Annual average wage in the mining industry was the highest of all industrial sectors for the state and in Mineral County. In Churchill County, the highest annual average wage ($36,107) was in the transportation, communications, and public utilities sector (Nevada Department of Employment no date-c).

Environmental Justice

U.S. Executive Order 12898 ("Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations") directs BLM to assess whether the Proposed Action or alternatives would have disproportionately high and adverse human health or environmental impacts on minority and low-income populations. Identification of environmental issues should be accomplished through public involvement and the scoping process. The Walker River Paiute Indian Tribe, the Fallon Paiute Tribe, and the Yerington Paiute Tribe were contacted by BLM to be included in the scoping process and to comment on the Proposed Action or alternatives. BLM has determined that issues associated with environmental justice would not be affected by the Proposed Action or alternatives.

CHAPTER 4

CONSEQUENCES OF THE PROPOSED ACTION AND ALTERNATIVES

INTRODUCTION

Chapter 4 describes potential direct and indirect impacts of the proposed expansion of the Denton-Rawhide Mine (Proposed Action). This chapter also addresses irreversible and irretrievable commitments of resources, residual adverse effects, and cumulative effects of the Proposed Action. Alternatives discussed in this chapter were developed to avoid potential impacts that could result from the Proposed Action. The selection process is described in Chapter 2, Project Alternatives.

Irreversible commitments of resources cannot be reversed except over an extremely long period. Irretrievable commitment refers to resources that are lost for a period. Residual adverse effects are those remaining after implementation of mitigation measures. Cumulative effects result from the incremental impacts of an action when added to other past, present, or reasonably foreseeable actions. Implementation of the Proposed Action and/or alternatives would cause resources to be consumed, committed, or lost during the life of the Denton-Rawhide Mine project.

BLM has reviewed significant aspects of the Proposed Action and the following alternatives to the Proposed Action: (1) No Action Alternative, and (2) Alternative A (partial backfilling of the Murray Hill pit). The Agency Preferred Alternative is Alternative A. Mitigation measures would be selected from those identified in this section of the EIS. Impacts associated with the Agency Preferred Alternative include those described for the Proposed Action and these impacts may be reduced or eliminated by implementation of mitigation measures.

Potential mitigation measures described in this chapter have been developed by BLM and are not part of KRMC's Denton-Rawhide Mine expansion proposal. Mitigation or monitoring measures can be required by BLM as a condition or stipulation of approval and authorization (Record of Decision) of the amended Plan of Operations.

GEOLOGY AND MINERALS

DIRECT AND INDIRECT IMPACTS

Proposed Action

The proposed mine expansion would directly impact geologic and mineral resources within the project area through relocation of approximately 36.8 million tons of waste rock between 1997 and 2001. During this time, 32.7 million tons of ore would be processed and spent ore would remain in various leach pads. Also, an estimated 495,000 ounces of gold and 3,960,000 ounces of silver would be extracted from the precious metal resource.

The Proposed Action could create indirect impacts by exposing sulfide material in pit walls to oxygen, and through placement of potentially acid-producing rock in waste rock disposal areas and ore stockpiles. Rain and snowmelt infiltrating through waste rock and ore piles could potentially cause an acidic water discharge. To evaluate the acid-producing potential, static testing was conducted on rocks from the Denton-Rawhide Mine project area. Static tests measure absolute amounts of sulfide and carbonate present in rock samples and allow estimates of acid neutralization potential (ANP), acid generation potential (AGP), and net acid neutralization potential (NANP = ANP-AGP).

Results of static tests (KRMC 1995) show that of the approximately 36.8 million tons of waste rock to be mined for the Proposed Action, 8 percent (approximately 3 million tons) is sulfide-bearing and has a potential to generate acid. The average weighted ANP is 25.5 percent $CaC0_3$ and the weighted average AGP is 2.6 percent $CaCO_3$; therefore, the total weighted average ANP:AGP ratio is approximately 9.81 percent $CaC0_3$. The excess calcium carbonate-equivalent neutralization capacity meets the NDEP (November 14, 1990) criteria for non-acid generating rocks (ANP:AGP ratio of 1.2 or greater).

Results of the static tests are consistent with geologic understanding of the deposit. Oxidation is independent of rock type, and sulfide minerals occur in all rock types but Quaternary-age alluvium. Sulfide minerals in waste rock have been oxidized in approximately 92 percent of the waste rock to be mined, resulting in vari-colored oxide waste rock. After oxidation, sulfide minerals are not available for oxidation/reduction reactions that generate acid. As discussed in Chapter 3, Geology and Minerals, mixed oxide/sulfide waste rock constitutes less than 1 percent of the waste rock, and sulfide waste rock makes up approximately 7 percent of the waste rock (KRMC 1995). Based on existing ore and waste rock characteristics, oxide/sulfide ratios are expected to be similar for the proposed mine expansion area.

The waste rock sampling and handling program developed by KRMC takes advantage of color differences in the oxidized versus unoxidized rocks. Sulfide rocks are characterized by a relatively consistent blue-gray color. With minimal instruction, loader operators can recognize differences in rock types and direct placement of waste rock accordingly.

The KRMC reclamation plan calls for surrounding acid-generating waste rock with nonacid-generating waste rock (Agra 1995). The sulfide formations are visually identified in the mine pit and selectively deposited and randomly mixed with material in the center of the waste rock disposal facility. Capping would utilize 4 feet of oxide waste rock. Potentially acid-generating material would not be placed along outer slopes or on native ground. Reclamation plans for the waste rock disposal facilities are described in Chapter 2.

Acidic water discharge from waste rock disposal facilities and ore stockpiles would be mitigated by the arid climate, acid-neutralizing alluvium and waste rock, and lack of surface water and groundwater. Ore stockpiles are not expected to exist after mine closure, and would therefore have a relatively short-term potential to produce acid drainage.

Design criteria used to ensure stability of project facilities are described in Chapter 3 (Geology and Minerals, Area Seismicity). Facilities were designed in accordance with NDEP specifications. Waste rock disposal facilities, leach pads, and mine pit slopes were designed and constructed for wet climate cycles, storm conditions, and earthquakes.

Alternative A

Alternative A would have the same direct and indirect impacts on geologic and mineral resources as the Proposed Action, except that partially backfilling the Murray Hill pit would limit the likelihood of further mining of possible ore reserves in those areas.

No Action Alternative

The No Action Alternative would eliminate mine expansion and avoid potential direct and indirect impacts. It would also eliminate removal of approximately 495,000 ounces of gold and 3,960,000 ounces of silver from the geologic resource.

POTENTIAL MITIGATION AND MONITORING MEASURES

No additional mitigation and monitoring measures are proposed beyond those already in-place for the Denton-Rawhide Mine. Existing measures include a waste rock monitoring program required by KRMC's water pollution control Permit No. NEV88018, and segregation/encapsulation of sulfide-bearing waste rock.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Approximately 495,000 ounces of gold and 3,960,000 ounces of silver would be removed from the geologic resource.

RESIDUAL ADVERSE EFFECTS

No unmitigated residual adverse impacts on the geologic resource would be expected to result from the Proposed Action or alternatives.

PALEONTOLOGICAL RESOURCES

DIRECT AND INDIRECT IMPACTS

Proposed Action

Impacts on fossils that may exist in the area proposed for mine expansion would be direct, caused by physical disturbance. Because volcanic rocks and Quaternary-age sediments would be excavated by the Proposed Action, it would be unlikely that invertebrate fossils would be impacted. However, activities that disturb any sediments should be conducted with an awareness that vertebrate fossils may be present.

Alternative A

Impacts on paleontological resources resulting from this alternative would be the same as those discussed under the Proposed Action.

No Action Alternative

The No Action Alternative would eliminate potential impacts on paleontological resources in areas of proposed development.

POTENTIAL MITIGATION AND MONITORING MEASURES

Steps would be taken when appropriate, to identify and preserve any fossils found. If fossils are discovered, KRMC will contact BLM to determine steps necessary for their recovery.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Irreversible and irretrievable commitment of paleontological resources would occur if fossils are encountered as a result of the Proposed Action.

RESIDUAL ADVERSE EFFECTS

No residual adverse effects on paleontological resources are anticipated as a result of the Proposed Action or alternatives.

AIR RESOURCES

DIRECT AND INDIRECT IMPACTS

Proposed Action

Fugitive dust and gaseous emissions would continue to be the primary air quality impacts at the Denton-Rawhide Mine; however, emissions are not expected to exceed current standards. Mine emissions would not affect any Class I areas.

Particulate Emissions

Particulate emissions from expanded mining and construction proposed for the Denton-Rawhide Mine would be caused by drilling, blasting, excavating, loading, hauling, and dumping of waste rock and ore. Particulate emissions would result from crushing, handling, and storage of ore. In addition to particulates from construction, mining, and ore processing, ambient particulates from wind erosion, traffic on unpaved roads, agricultural operations, and other sources exist within the project area. Levels of particulate emissions from the Proposed Action are expected to be similar to those for currently authorized mining.

Gaseous Emissions

The Proposed Action would be a source of gaseous air pollutants including sulfur dioxide, carbon monoxide, oxides of nitrogen, and volatile organic compounds. Sources include vehicle exhaust and ammonium nitrate - fuel oil (ANFO) used as a blasting agent.

In the proposed heap leach process, sodium cyanide solution would be maintained at a pH in excess of 10.5 through use of lime. This pH level would prevent hydrogen cyanide gas (HCN) from forming and escaping to the atmosphere. Levels of gaseous emissions associated with the Proposed Action are expected to be similar to those now in existence at the Denton-Rawhide Mine. No ambient air standards would be exceeded.

Alternative A

Impacts on air resources resulting from this Alternative A (partial backfilling of Murray Hill pit), would be the same as those discussed under the Proposed Action. Ambient air standards would not be expected to be exceeded.

No Action Alternative

Impacts from the No Action Alternative would be the same as those discussed under the Proposed Action. The duration of impacts associated with the Denton-Rawhide Mine would be reduced, because the No Action Alternative would shorten active mining operations by 5 years.

POTENTIAL MITIGATION AND MONITORING MEASURES

No mitigation or monitoring measures beyond those presently employed in the mine are proposed. Existing measures to reduce emissions and monitor air quality are satisfactory for air resources at the Denton-Rawhide Mine.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

No irreversible or irretrievable commitment of resources would be expected from the Proposed Action or alternatives.

RESIDUAL ADVERSE EFFECTS

No residual adverse effects on air resources are anticipated as a result of the Proposed Action or alternatives. Once mining ceases and reclamation is completed, air quality would be expected to return to pre-mining conditions.

WATER QUANTITY AND QUALITY

DIRECT AND INDIRECT IMPACTS

Proposed Action

The proposed Denton-Rawhide Mine expansion generally would have no direct or indirect impacts on water resources. No surface water exists in the vicinity of project site, except occasional drainage in small channels from significant precipitation events, and depth to groundwater is several hundred to several thousand feet below the mine site and pit. The Proposed Action would require that pumping of groundwater from the mine supply wells located in the Gabbs Valley continue at similar rates for an additional 5 years.

Surface Water

No direct or indirect impacts on surface water are expected to occur as a result of the Denton-Rawhide Mine expansion. All drainages in Hydrographic Area No. 122 (Gabbs Valley), including the project site, are ephemeral (i.e., flowing only in response to significant precipitation events and/or snowmelt runoff). Most of the rain that falls in the project area infiltrates into the thin soil horizon and/or evaporates before reaching the main Gabbs Valley 3 miles to the southeast. The nearest perennial surface water sources, the Walker and Carson river drainages, are located 20 to 25 miles from the Denton-Rawhide Mine.

Several ephemeral drainages in the project area have been disturbed by existing mine pits, a waste rock disposal facility, heap leach pads, and ore stockpiles. A primary diversion ditch would be rerouted around the disturbance areas so that any potential run-on of surface water from precipitation would be directed around the project site. Potential for acid mine drainage in the project area is discussed under the Geology and Minerals section of this chapter.

No springs or seeps are known to occur in the vicinity of the Denton-Rawhide Mine (radius of at least 6 miles). The lack of any perennial surface water features in the Gabbs Valley hydrographic basin and the considerable depth to groundwater (see below) supports the absence of any springs or seeps.

Groundwater

As stated in Chapter 3 (Water Quantity and Quality section), depth to groundwater below the Denton-Rawhide Mine site is several hundred to several thousand feet. No groundwater has been encountered in over 1,600 exploration holes drilled at the project site. Because the existing and proposed mine pit would not intercept the groundwater table, the Proposed Action would have no direct or indirect impacts on groundwater.

The Denton-Rawhide Mine project site is part of the general mountainous groundwater recharge area for the Gabbs Valley; however, the Proposed Action is not expected to have a significant effect on overall basin recharge because of the relatively small disturbance area and low precipitation rate. The mine pit may increase groundwater recharge slightly through infiltration of precipitation to the subsurface. Data collected at other locations in Nevada in similar environments indicate recharge in steeper mountainous terrain is approximately 0.05 to 0.2 inches, or about 2 percent of mean annual precipitation.

The two mine supply wells located in the Gabbs Valley would continue withdrawing groundwater at rates similar to those for the existing mine operation. With the Proposed Action, pumping would continue for an additional 5 years, resulting in additional drawdown of the water table. Modeling to predict groundwater drawdown resulting from pumping the two water supply wells at a combined rate of 1,000 gpm for 10 years shows that drawdown would be minimal (less than about 1 foot).

Alternative A

Direct or indirect impacts on water resources from partial backfilling of the Murray Hill pit would be similar to those described for the Proposed Action.

No Action Alternative

With the No Action Alternative, pumping of groundwater from supply wells in the Gabbs Valley would end 5 years sooner.

POTENTIAL MITIGATION AND MONITORING MEASURES

No mitigation or monitoring measures beyond those presently employed at the Denton-Rawhide Mine would be needed. The lack of surface water and depth to groundwater precludes the potential for significant impacts on water resources.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Groundwater withdrawn by the water supply wells in Gabbs Valley would be an irretrievable commitment of water resources. This water would be consumed for the Denton-Rawhide Mine operations. Mine expansion would require pumping an additional 5 years beyond the pumping period associated with the existing operations.

RESIDUAL ADVERSE EFFECTS

No residual adverse effects on water quantity and quality are expected from the proposed Denton-Rawhide Mine expansion.

SOIL RESOURCES

DIRECT AND INDIRECT IMPACTS

Proposed Action

The Proposed Action would result in approximately 364 acres of new disturbance, and an increase in height of the waste rock disposal facility. New disturbance would include expansion of the existing pit and construction of a leach pad, a diversion channel, and solution ponds. Direct impacts would include modification to soil chemical and physical characteristics, loss of soil to wind and water erosion, and decreased soil biological activity.

Chemical changes would result from mixing of surface soil with subsoil during salvage activities. The primary impact would be a reduction in organic matter content of surface soil. A slight increase in salt content could also result from mixing surface and subsurface materials.

Impacts on physical characteristics of soil during salvage and stockpiling would include loss of soil structure and increased coarse fragment content. Pulverization by construction equipment would decrease permeability, available water-holding capacity, and effective rooting depth. Pulverization would also increase the loss of finer grained soil due to wind and water erosion. Soil compaction would not be expected due to the coarse fragment content and arid environment.

Soil biological activity would be significantly reduced or eliminated during stockpiling as a result of anaerobic conditions created in deeper portions of the stockpiles. After soil redistribution, biological activity would slowly increase and eventually reach pre-disturbance levels. Due to the generally poor quality of soil in the project area, soil materials available for reclamation would also be considered poor (i.e., high coarse fragment content, low organic matter, and low water-holding capacity).

Anticipated annual soil loss following growth media redistribution was calculated using the Revised Universal Soil Loss Equation (RUSLE 1.04) computer model (Soil and Water Conservation Society 1995). Twelve scenarios were analyzed based on anticipated post-mining slope configuration of the waste rock dump. **(Table 4-1)** shows RUSLE modeling results in tons of soil per acre lost annually.

Soil loss from an unprotected 500-foot slope during the first year can be expected to be 10 tons per acre. If the slope is reduced to 100 feet in length using terraces, soil loss is decreased to 4.9 tons per acre. With a mulch cover of 80 percent applied during the first year, soil loss is equal to that of revegatated slopes at year 5. Mulching and/or successful revegetation can reduce soil losses to one-tenth that of unprotected slopes.

TABLE 4-1
ANNUAL SOIL LOSSES AS PREDICTED BY RUSLE[1]

Years Following Topsoil Redistribution	Slope	Slope Length Between Terraces	Slope Cover	Soil Loss (tons/acre)
0	3H:1V	500	None	10
0	3H:1V	250	None	9.3
0	3H:1V	100	None	4.9
0	3H:1V	500	Mulch[2]	0.4
0	3H:1V	250	Mulch[2]	0.4
0	3H:1V	100	Mulch[2]	0.4
5	3H:1V	500	Vegetation[3]	4.9
5	3H:1V	250	Vegetation[3]	0.8
5	3H:1V	100	Vegetation[3]	0.4
0	16H:1V	500	None	1
0	16H:1V	500	Mulch[2]	0.1
5	16H:1V	500	Vegetation[3]	0.1

[1] Revised Universal Soil Loss Equation computer model (1.04) (Soil and Water Conservation Society 1995).

[2] Rock and mulch cover of 80 percent.

[3] Vegetative residue ground cover of 250 lbs/acre; vegetative cover of 30 percent.

Soil loss would occur during reclamation as a result of loading, hauling, and respreading and from erosion after respreading until vegetative cover is established.

Potential indirect effects caused by soil disturbance would include dust and its off-site deposition. Sedimentation in streams would not be expected to be an issue due to low rainfall and lack of perennial streams in or near the study area.

Alternative A

Partial backfilling of the Murray Hill pit would result in 35 additional acres of land requiring growth medium. This would not significantly reduce the depth of redistributed growth media over the entire project area.

No Action Alternative

Under this alternative, additional soil impacts would not occur. KRMC would continue with soil mitigation and monitoring measures required in existing permits.

POTENTIAL MITIGATION AND MONITORING MEASURES

The Proposed Action would result in 195,780 cubic yards of growth medium (**Table 3-5**) being salvaged in addition to 893,700 cubic yards already stockpiled. The 1,089,480 total cubic yards of growth medium would cover 996 acres to a minimum depth of 6 inches.

Additional measures could include the following:

- Seeding soil stockpiles to help minimize erosion.
- Testing growth medium for nutrient and organic levels prior to respreading and seeding.
- Ripping or scarifying respread growth medium to reduce compaction.
- Reducing traffic over respread growth medium to minimize compaction.
- Varying slope gradient on reclaimed heap leach facilities to create more drainage diversity.
- Mulching with straw or hay to enhance revegetation.
- Selectively placing coarse rock on sideslopes to curtail erosion as well as provide wildlife habitat.
- Monitoring soil stripping operations to maximize the amount of growth medium available.
- Monitoring and documenting growth medium stockpiles and erosion and sediment control structures.
- Applying dust control measures such as water and/or tackifier as necessary.

All areas outside the open pit would be recontoured to slopes of 3H:1V or less. Sides of the waste rock disposal facility and leach pad would be graded to slopes that would sustain revegetation, divert runoff, promote infiltration, and eliminate pounding. The top of the waste rock disposal facility would be graded to slope away from faces to reduce erosion. Diversion ditches would divert runoff and eliminate ponding.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Soil lost to erosion is an irretrievable and irreversible commitment of resources. Approximately 200 acres (part of the previously approved pit exemption) would not be reclaimed and would therefore be lost to future land uses. Implementation of Alternative A would reduce the unreclaimed area to 165 acres.

RESIDUAL ADVERSE EFFECTS

The Proposed Action would result in soil loss or discontinuation of natural soil development, a decrease in water-holding capacity, breakdown of soil structure, and loss of organic matter content. Reclamation steps such as grading and revegetating, however, would promote development of soil on disturbed areas. Loss of soil fertility and soil microorganisms, reduced vegetative productivity, and loss of land-use potential could be reversed within 5 to 15 years after reclamation. If reclamation were not successful, or not implemented (such as in the open pit), the Proposed Action would have long-term adverse effects.

VEGETATION

DIRECT AND INDIRECT IMPACTS

Proposed Action

The Proposed Action would disturb 364 acres within the study area, including 16.4 acres previously disturbed (prior to 1981) by mine shafts, waste rock disposal facilities, and roads. Since 1981, approximately 1,005 acres have been disturbed at the Denton-Rawhide Mine, 16.5 of which have been reclaimed. In total, about 1,369 acres would be disturbed by previous and proposed operations at the mine site.

The largest impact from the Proposed Action would occur in the Bailey's greasewood/shadscale association with less disturbance occurring in the big sagebrush/black sagebrush association.

Disturbed sites and recently revegetated areas are susceptible to weed invasion. It is likely that undesirable annual grasses such as cheatgrass, and annual forbs such as halogeton, would further invade the study area. Weedy species may compete with native species and contribute to a decline in ecological conditions within the study area.

Past activities such as historic mining and exploration, road and railroad construction, and livestock grazing, have disturbed native vegetation and contributed to the introduction of weedy species to the area. Activities following closure of the Denton-Rawhide Mine including further mineral exploration and livestock grazing, could disturb native or reclaimed vegetation through direct damage and through soil erosion or compaction.

Indirect impacts on vegetation would include potential movement of weedy species from reclaimed areas to adjacent native vegetation, and coating of adjacent or downwind vegetation with dust. Vegetation coated with dust has decreased productivity and is more susceptible to insect infestation.

Reclamation for the Proposed Action would result in revegetation of 164 acres. Reclamation of the waste rock disposal facility would be concurrent with mining activities. Reclamation of the heap leach pad, certain mining facilities, and roads would occur following mine closure.

Approximately 200 acres within the proposed Murray Hill pit expansion area would not be revegetated. In addition, no revegetation is planned for portions of roads that contain bedrock or do not have fine particles to serve as a growth medium.

The goal of reclamation would be to create a self-sustaining Reclaimed Disturbed Plant Community (RDPC) to assist in establishing post-mining land use. Canopy cover shrubs, grasses, and forbs in undisturbed areas of the mine currently ranges from 10 to 30 percent. KRMC's standard of revegetation success is 50 percent of current vegetative cover (i.e., 5 to 15 percent canopy cover). Noxious weeds would not count toward the 50 percent vegetative cover goal. Seed test plots were established in 1992 on 16.5 reclaimed acres. KRMC is monitoring these plots and, with BLM approval, would derive the RDPC from the seed test plot program.

Alternative A

Backfilling the northern and southern portions of the Murray Hill pit would restore approximately 35 acres to productive use following mining. The seed mix described above would be used to revegetate these areas. Other than reclamation of these acres, impacts on vegetation would be the same under this alternative as those described for the Proposed Action.

No Action Alternative

Under the No Action Alternative, disturbance of vegetation on 364 acres area would not occur.

POTENTIAL MITIGATION AND MONITORING MEASURES

Potential mitigation and monitoring for vegetation at the Denton-Rawhide Mine includes:

- Using variable seed mixes and/or rates suited to differences in slope, aspect, soil depth, and landscaped features of reclaimed areas. Seed mixes and rates should be determined from the on-site test plots currently being monitored by KRMC.
- Reestablishing, where practicable, the general topography of reclaimed areas to predisturbance conditions. Varying topography creates micro-sites with different plant growth conditions. Plant species respond differently to various slopes, aspects, and landform features.
- Preventing livestock grazing of revegetation for a minimum of two growing seasons.
- Monitoring disturbed and reclaimed areas to determine if weedy species are becoming established. If weeds are invading the area, anactive control plan should be developed and implemented.
- Monitoring revegetated areas to ensure that the 50 percent of current vegetative cover goal is achieved.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Under the Proposed Action, 200 acres within the Murray Hill pit expansion area would not be reclaimed, resulting in an irretrievable loss of vegetation. An irreversible loss of vegetative productivity on reclaimed areas would occur if reclamation is not successful. Under Alternative A, approximately 165 acres within the Murray Hill pit would not be reclaimed.

RESIDUAL ADVERSE EFFECTS

Residual adverse effects on vegetation include the expanded areas of the Murray Hill pit that would not be revegetated (200 acres for Proposed Action; 165 acres for Alternative A).

WILDLIFE AND FISHERIES RESOURCES

DIRECT AND INDIRECT IMPACTS

Proposed Action

Under the Proposed Action, approximately 364 acres of habitat would be disturbed by the project, all within the shadscale/sagebrush community.

Direct loss of habitat would eliminate forage, hiding cover, breeding sites, nesting cover, and thermal cover. Wildlife species dependent on these disturbed sites would die or be displaced to undisturbed habitat. Depending on species affected, behavior, density, and habitat, adjacent populations may experience increased mortality, decreased reproductive rates, or other responses. Species most likely to be affected would be chukar, passerine birds (e.g., black-throated sparrows and sage thrashers) small mammals, and reptiles. Although some habitat would be directly lost, large acreages of similar habitat are available in the area surrounding the project site.

Wildlife sensitive to human activity and noise such as mule deer, desert bighorn, and pronghorn antelope could be displaced by expanded mining activities; however, existing levels of mining and associated human activity probably have either displaced sensitive animals or acclimated some animals to these disturbances. Displacement of species from the immediate mine area would have negligible impacts because adequate undisturbed habitats are present adjacent to the mine. Big game habitat in the project area is not considered crucial to the viability of local or regional populations of mule deer, desert bighorns, or pronghorns.

Noise from mining operations and associated traffic is not expected to affect reproductive success or viability of regional wildlife populations. Many animals would become accustomed to the noise associated with mining and resume use of otherwise unaffected habitat.

Following mining, steep pit walls and benches in the unreclaimed Murray Hill pit may provide potential nesting sites for raptors and other birds that nest in rock cavities. The amount of this habitat would depend on steepness of walls, presence of ledges and cavities, and stability of the rock faces.

Ponds containing hazardous substances would be fenced to exclude most wildlife larger than a ground squirrel; however, small mammals, small birds, and reptiles could gain access to toxic solutions and could be killed by drinking or contacting cyanide solutions. Monitoring of existing operations has documented mortality of bull snakes and possible mortality of mourning doves and sparrows as a result of exposure to solution ponds containing cyanide. In 1995, one western grebe and one green-winged teal were killed in collision with netting that protect solution ponds.

Currently, KRMC has a State of Nevada Industrial Artificial Pond Permit specifying that solution ponds will have an 8-foot high fence to exclude wildlife and be covered to prevent access by bats and birds. The permit also requires periodic state inspections of the facility and documentation of wildlife mortalities associated with toxic solutions.

The proposed project would destroy the Hooligan adit, which has been used for roosting, hibernating, and possibly rearing of young by California myotis or small-footed myotis (identification uncertain), Townsend's big-eared bats, and pallid bats. Other shafts and adits in adjacent areas would not be directly affected by the Proposed Action.

The Hooligan and Regent adits provide habitat for the largest numbers of bats in the project area. Bats displaced from the Hooligan adit may move to the Regent shaft and adit or other abandoned mine structures in the project area. There are 12 abandoned mine structures that would not be disturbed by the Proposed Action; however, it is not known if all these structures would provide suitable habitat for the three or more species of bats occupying the Hooligan adit.

Disturbance of the Hooligan adit between approximately November and April would result in mortality of hibernating bats. Hibernating bats not directly killed by excavation would be displaced during a period when there is little or no food available and when temperatures outside are lethal to bats. Bats depend on limited fat reserves during winter hibernation. If they were displaced from hibernacula, bats would be unable to survive the remainder of the winter. Disturbance of the Hooligan adit when bats are raising young (May through July) would result in mortality of young bats.

Loss of the Hooligan adit could also affect wintering finches and other songbirds that seek protection for roosting during periods of cold and wind. Although loss of this habitat would likely reduce the capacity of the area to support wintering songbirds such as rosy finches, it would not significantly affect regional songbird populations. Migrating or wintering birds that may currently remain in the project area because of abandoned shafts and adits would probably seek habitat in other undisturbed shafts and adits or move elsewhere for overwintering.

Alternative A

Partial backfilling of the Murray Hill pit and subsequent reclamation would potentially restore approximately 35 acres of habitat for wildlife - primarily reptiles, small mammals, and songbirds. This small increase in upland habitat would have minor but beneficial impacts on local wildlife populations. Partial backfilling of the pit may also result in the loss of potential raptor nesting sites.

No Action Alternative

Under the No Action Alternative, 364 acres of upland habitat and several abandoned shafts and adits would not be destroyed. Habitat for bats and other wildlife would remain unchanged.

POTENTIAL MITIGATION AND MONITORING MEASURES

Loss of the Hooligan adit as a result of mine expansion would have the potential to affect local populations of bats that utilize it for roosting, rearing of young, or hibernating. Direct mortality of bats from excavation of abandoned shafts and adits could be avoided by evacuating bats from the shafts/adits in the fall, after young have been reared and before hibernation. According to Tuttle and Taylor (1994), capturing bats is best achieved by covering mine or adit entrances with netting soon after most bats have exited to feed on a warm evening. Those trapped inside can be allowed to escape by opening the entrance just before sundown on the following evening and closing the netting after bats have exited. Two or three repetitions on warm evenings should successfully evacuate most members of a summer colony (Tuttle and Taylor 1994). The shaft and adits could then be permanently closed.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Wildlife resources are generally considered renewable. If wildlife habitat lost through the Denton-Rawhide Mine expansion is reclaimed to pre-mining conditions after project completion, no wildlife resources would be irreversibly or irretrievably lost. Open pits, however, would result in land irretrievably lost to terrestrial wildlife use (200 acres for Proposed Action; 165 acres for Alternative A).

RESIDUAL ADVERSE EFFECTS

Project development would result in loss of the Hooligan adit, a structure used by roosting and hibernating bats. The unreclaimed open pit would be a residual adverse effect on terrestrial wildlife.

THREATENED, ENDANGERED, CANDIDATE, AND BLM SENSITIVE SPECIES

DIRECT AND INDIRECT IMPACTS

Proposed Action

No threatened, endangered, or candidate species have been recorded in the project area. Two Nevada BLM-sensitive bat species probably are present in the project area (i.e., small-footed myotis and pale Townsend's big-eared bat), and two other BLM-sensitive bat species may occur but are unlikely present because of habitat limitations (i.e., Yuma myotis and long-legged myotis). Suitable habitat for burrowing owls appears not to be present in the project area and field studies did not document their presence.

The Proposed Action would destroy the Hooligan adit used for roosting and hibernation by Nevada

BLM sensitive bat species. Impacts on BLM-sensitive bat species would be the same as those described for other bats (see Terrestrial Wildlife, this chapter). Burrowing owls probably would not be affected by the Proposed Action.

Alternative A

Partial backfilling of the Murray Hill pit could reduce the number of potential nesting and roosting sites for bats. Alternative A would not likely result in significant impacts to Nevada BLM-sensitive species.

No Action Alternative

Under the No Action Alternative, no impacts to threatened, endangered, or candidate species or their habitat would occur beyond those impacts associated with currently authorized mining.

POTENTIAL MITIGATION AND MONITORING MEASURES

Mitigation measures suggested for bats under the Terrestrial Wildlife section (this chapter) would also be appropriate for BLM-sensitive bat species.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The Proposed Action would result in no irreversible or irretrievable commitment of resources that would affect threatened, endangered, candidate, or BLM-sensitive species.

RESIDUAL ADVERSE EFFECTS

Project development would result in loss of the Hooligan adit which provides habitat for roosting and hibernating bats.

RANGE RESOURCES (LIVESTOCK GRAZING)

DIRECT AND INDIRECT IMPACTS

Proposed Action

Under the Proposed Action, an additional 927 acres would be fenced into the mining operation and would be unavailable for livestock grazing. This represents a loss of 22 AUMs of active grazing preference, or 0.6 percent of the total 3,680 AUMs, from the La Beau Flat Allotment. Of the 927 acres temporarily removed from livestock grazing, 364 acres would be directly disturbed by the Proposed Action; 164 acres would be revegetated during reclamation (i.e., 200 acres of Murray Hill pit expansion would not be revegetated). Available AUMs on these reclaimed area may be less than before mining because cover would be approximately 50 percent of pre-disturbance cover.

Access to range improvements (water tanks) via the study area would not be affected by the Proposed Action. No change in range management or grazing permits is anticipated as a result of the Proposed Action.

Following mining operations, a 6-foot berm constructed approximately 100 feet from the edge of the Murray Hill pit. This berm would discourage cattle from wandering near the pit edge.

Alternative A

Backfilling the northern and southern portions of the Murray Hill pit would restore approximately 35 acres, or 0.8 AUMs, to productive use following mining. However, this acreage would only be restored to active grazing preference if reclaimed areas were accessible to livestock. Other than reclamation of 35 acres, impacts on range resources under this alternative would be the same as those described for the Proposed Action.

No Action Alternative

Under the No Action Alternative, 927 acres (22 AUMs), would not be temporarily removed from cattle grazing, and 200 acres (6 AUMs) would not be permanently removed from the allotment.

POTENTIAL MITIGATION AND MONITORING MEASURES

Potential mitigation and monitoring methods include:

- Patrolling the project boundary fence to ensure that livestock cannot access the mining operations area.
- Maintaining current access through the study area to water troughs and storage tanks on the La Beau Flat Allotment, or creating new access.
- Constructing a four-strand barbed wire fence around the pit to prevent cattle access.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Under the Proposed Action, 200 acres or 6 AUMs of active grazing preference would be irreversibly lost on the La Beau Flat Allotment as a result of the unreclaimed pit. Under Alternative A, approximately 5 AUMs of active grazing preference would be irreversibly lost on the La Beau Flat Allotment.

RESIDUAL ADVERSE EFFECTS

The unreclaimed open pit would be a residual adverse effect on range resources for the Denton-Rawhide Mine (i.e., 200 acres unreclaimed for the Proposed Action and 165 acres unreclaimed for Alternative A).

RECREATION

DIRECT AND INDIRECT IMPACTS

Proposed action

The Proposed Action would increase the disturbance area of the Denton-Rawhide Mine project by an additional 364 acres (201 private acres and 163 public acres). This area would not be available for recreation until cessation of mining. A 6-foot high berm constructed around the edge of the open Murray Hill pit would discourage people from coming near the pit; however, public safety hazards are possible. The project area is not intensively used for recreation and does not offer unique recreational opportunities. The Carson City District contains large areas of similar land available to the public for dispersed recreation.

Construction of the heap leach pad would require an increase in employment of approximately 20 workers for a period of 6 months. Temporary use of campgrounds by construction workers could diminish campground use by recreationists. Recreation in the area could be impacted through increased camping, hunting, and OHV use. No additional employees would be hired after construction of the heap leach is completed.

Alternative A

Partial backfilling of the Murray Hill pit would result in an additional 35 acres for recreational use. The backfilled northern portion of the pit would still be partially surrounded by steep highwalls which would preclude recreational use.

No Action Alternative

Under the No Action Alternative, no additional public or private land would be disturbed by mining. Thus, 163 acres of public land would not be removed from the recreation base and there would be no additional impact on recreation in the area.

POTENTIAL MITIGATION AND MONITORING MEASURES

No mitigation or monitoring for recreation would be required for the Proposed Action and Alternative A.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Recreation would not be irreversibly or irretrievably affected by the Proposed Action or Alternative A.

RESIDUAL ADVERSE EFFECTS

A residual adverse effect of the Proposed Action on recreation would be the loss of public land associated with the Murray Hill pit expansion (163 acres public land). In addition, long-term public safety hazards could exist with the open pit.

LAND USE AND ACCESS

DIRECT AND INDIRECT IMPACTS

Proposed Action

The proposed Denton-Rawhide Mine expansion would disturb an additional 364 acres (163 acres public and 201 acres private) beyond that currently approved. Land ownership in the area would remain the same. The existing power line and water line would continue to be used.

At mine closure, a 6-foot high berm would be constructed around the open pit. An additional 5,271 linear feet of berm would be necessary to enclose the expanded pit area. Warning signs would be posted every 200 feet. These signs would only be effective until they are removed, destroyed, or fall over. Public safety hazards could occur for those people who may climb over the berm.

A portion of the county road would need to be realigned to accommodate the Murray Hill pit expansion; however, access along the county road would be maintained during the life of the project.

Alternative A

Backfilling the southern portion of the Murray Hill pit would result in 35 additional acres of reclaimed land which could be accessed. The northern backfill area would remain inaccessible due to pit highwalls.

No Action Alternative

Under this alternative, there would be no further impacts on land use and access at the Denton-Rawhide Mine beyond those that will occur under currently authorized mining.

POTENTIAL MITIGATION AND MONITORING MEASURES

No mitigation or monitoring measures have been identified for land use or access.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Pre-mining land use would be irreversibly and irretrievably lost in the Murray Hill mine pit area (200 acres for Proposed Action and 165 acres for Alternative A).

RESIDUAL ADVERSE EFFECTS

Steep walls in the mine pit would prevent the pit area from attaining pre-mining land uses. Public safety is a long-term concern associated with the mine pit. Disturbed land outside the pit area would be restored and reclaimed to beneficial uses.

AESTHETICS (VISUAL RESOURCES AND NOISE)

VISUAL RESOURCES

DIRECT AND INDIRECT IMPACTS

Proposed Action

Visual impacts of the Proposed Action and alternatives were analyzed using procedures set forth in the Visual Contrast Rating Handbook (see Chapter 3, Visual Resources). Changes in landscape from the Proposed Action and alternatives are compared with the characteristic landscape to determine the degree of contrast in form, line, color, and texture. If the degree of contrast does not meet the Visual Resource Management (VRM) System objectives, the project should be redesigned or mitigation measures proposed. As noted in Chapter 3, all of the project site is located on VRM class IV land, which allows the greatest degree of modification of the landscape by management activities.

The primary impact of the Proposed Action would be large-scale modification of landforms. Enlargement of angular, blocky forms, and horizontal lines of existing mining facilities would create weak contrasts with the natural rounded, rolling hills and ridges of the characteristic landscape.

Land clearing and construction of waste rock storage and leach facilities would expose soil and rock material in a variety of colors ranging from light grayish tan to reddish tan to very dark gray. Contrast between these colors and those existing in the landscape would range from moderate in bright sunlight and when front-lighted to weak in overcast conditions and when back-lighted.

Clearing of vegetation in mine expansion areas would create weak to moderate color contrasts with the existing landscape. New lines would be introduced delineating the edges of cleared areas and some change in texture would be seen, but overall contrast would be weak. Visual impacts from new structures would be small when compared with the visually dominant waste rock disposal areas and mine pits.

When viewed from the KOP, the Proposed Action would create weak contrasts with the existing landscape (**Figure 4-1**). The proposed increase in size of the existing leach pad would increase the visual contrast of this facility. Angular forms and more vivid color hues would offer weak contrasts with the existing landscape. Exposure of unweathered soil and rock would create weak to moderate contrasts in color with the characteristic landscape.

Figure 4-2 depicts the post-reclamation landscape as viewed from the KOP. Reclamation would reduce visual contrasts associated with the Proposed Action.

Alternative A

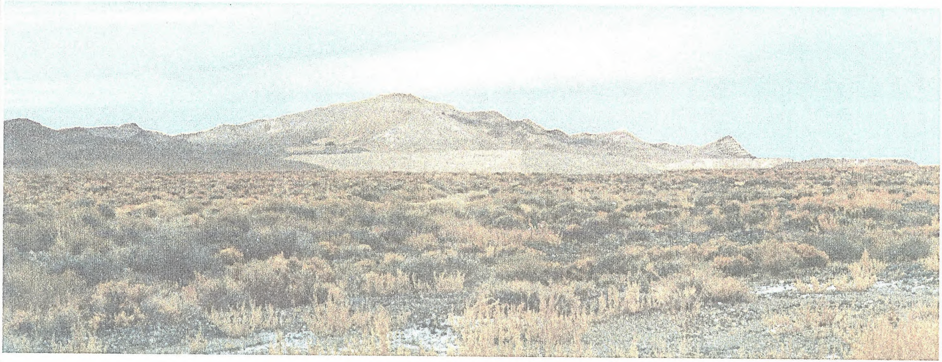
Partial backfilling of the Murray Hill pit would result in a slight reduction in visual impacts as viewed from the KOP. Overall visual contrast would remain weak.

No Action Alternative

Under this alternative no visual impacts would occur beyond those already present or associated with permitted activities.

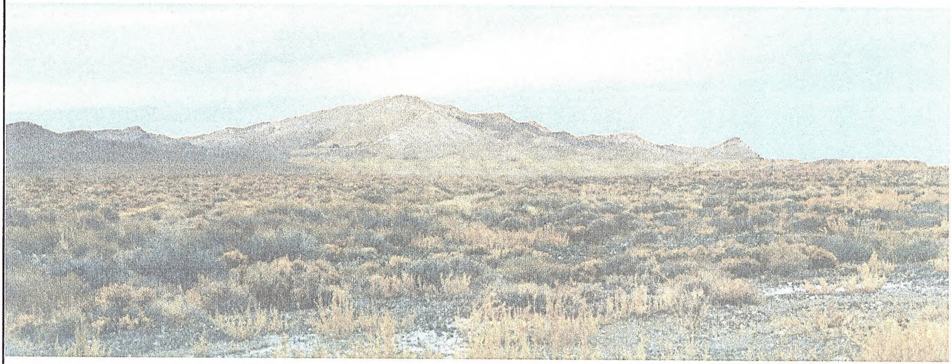
POTENTIAL MITIGATION AND MONITORING MEASURES

The objective of mitigation measures for visual resources is to reduce visual contrasts based on three concepts: (1) siting of facilities in less visible areas; (2) minimizing disturbance; and (3) repeating the basic elements of form, line, color, and texture. In addition to measures included in the Proposed Action, the following measures could be applied to minimize visual impacts of the Proposed Action and alternatives.



Post-Mining

Post-Mining Conditions From KOP
Denton-Rawhide EIS
Mineral County, Nevada
FIGURE 4-1



Post-Reclamation

Post-Reclamation Conditions From KOP
Denton-Rawhide EIS
Mineral County, Nevada
FIGURE 4-2

- Varying slope gradients on embankments (between 3H:1V and 2.3H:1V) to create diversity of form and reflect the naturally rolling, rounded forms of the existing topography.
- Rounding edges of embankments to reduce the angular appearance and soften edges.
- Minimizing contrasts in color of disturbed soil or rock through use of chemical staining agents.
- Establishing clearly defined construction limits through use of irregular shapes that reflect existing forms and patterns.
- Planning revegetation so that colors and textures blend with undisturbed lands.
- Minimizing visual contrast of structures with natural forms by using colors that blend with the land rather than the sky and by using finishes with low levels of reflectivity.
- Painting structures a slightly darker color than the surrounding landscape to compensate for the effects of shade and shadow.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

An irretrievable commitment of visual resources would occur primarily during mining and until reclamation is successful. Impacts on visual resources would be reduced through reclamation and mitigation measures.

RESIDUAL ADVERSE EFFECTS

Following reclamation, weak contrasts would remain, primarily as a result of the prismoidal forms and straight lines of the reclaimed leach pad embankments. Finer and more uniform soil in these areas would also create weak contrasts in texture with the existing landscape.

NOISE

DIRECT AND INDIRECT IMPACTS

Proposed Action

Noise generated from the Proposed Action would continue to be the same as the present operation at the Denton-Rawhide Mine. The same types of equipment used in the existing operation would be used for the Proposed Action. Blasting in pits would continue at the same frequency of approximately once a day. The Proposed Action would result in continuation of blasting, mining, and milling.

Alternative A

Partial backfilling of the Murray Hill Pit would result in noise impacts similar to those for the Proposed Action.

No Action Alternative

Under the No Action Alternative, impacts from noise would cease at the end of current mine operations.

POTENTIAL MITIGATION AND MONITORING MEASURES

No mitigation or monitoring measures for noise would be required for the Proposed Action and Alternative A.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

There would be no irreversible or irretrievable impacts related to noise.

RESIDUAL ADVERSE EFFECTS

There would be no residual adverse effects on the environment from noise generated during mining and reclamation. When mining activity ceases, noise would be reduced to low levels associated with reclamation (recontouring and seeding) for approximately 15 years.

CULTURAL RESOURCES

DIRECT AND INDIRECT IMPACTS

Proposed Action

One cultural resource has been recorded in the area of potential effect (project area). This site, the historic townsite of Rawhide, is not eligible for inclusion in the National Register of Historic Places (NRHP). An additional 12 historic sites have also been recorded within a 1-mile buffer surrounding the Denton-Rawhide project area. None of the sites in the buffer zone is eligible for the NRHP.

No concerns regarding Native American traditional or religious uses of the proposed Denton-Rawhide expansion area have been identified. Therefore, no direct or indirect impacts on Native American traditional or religious values would be expected as a result of the Proposed Action.

Alternative A

Partial backfilling of the Murray Hill pit would result in no direct or indirect impacts on NRHP-eligible cultural resource properties.

Partial backfilling of the Murray Hill pit would not directly or indirectly impact Native American religious concerns.

No Action Alternative

With this alternative, there would be no direct or indirect impacts on NRHP-eligible cultural resource properties.

Under this alternative, there would be no further direct or indirect impacts on Native American religious or traditional values, practices, properties, human remains, or cultural items.

POTENTIAL MITIGATION AND MONITORING MEASURES

No mitigation or monitoring measures would be necessary.

Mitigation and monitoring measures are not necessary for Native American religious concerns.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

No cultural resources would be irreversibly or irretrievably impacted by the Proposed Action or Alternative A.

Native American religious concerns would not be irreversibly or irretrievably impacted as a result of the Proposed Action or Alternative A.

RESIDUAL ADVERSE EFFECTS

There would be no residual adverse effects on cultural resources from the Proposed Action.

No residual adverse effects on Native American traditional or religious concerns have been identified as a result of the Proposed Action.

SOCIAL AND ECONOMIC RESOURCES

DIRECT AND INDIRECT IMPACTS

Proposed Action

Impacts on socioeconomic resources occur when a significant number of workers and their families move into an area as a result of jobs either directly or indirectly created by mine development. Because no additional employees would be needed for construction or operation activities associated with the mine expansion, no new people are expected to migrate into the area. Therefore, socioeconomic resources such as community services, housing, and social well-being would not be adversely affected.

Positive socioeconomic impacts would result with the Proposed Action. KRMC employment at the Denton-Rawhide Mine and indirect employment induced by the mine would continue 5 years beyond the current mining schedule. Salaries paid to workers employed at the mine and other economic sectors induced by the mining operation as well as sales and property taxes paid by these workers would continue for this additional 5-year period. Revenues generated by net proceeds of minerals taxes and property taxes would continue to be collected by local and state governments. Workers and their families would continue with the same quality of life that exists with current operations.

Alternative A

Impacts on social well-being, community services, housing, and economic resources in the study area under Alternative A would be the same as with the Proposed Action.

No Action Alternative

Under the No Action Alternative, mining would cease 5 years earlier than the Proposed Action and most of the KRMC work force would be laid off, although some employees would be retained for mine closure and reclamation activities.

Reduction of the work force would increase unemployment, reduce wages, diminish local spending, decrease tax revenues to local and state governments, burden public assistance programs, and decrease the social well-being of some local residents. Crime and other indicators of social well-being (e.g., divorce, domestic abuse, suicide, alcohol and other drug abuse, and public assistance) would increase in the short term. All of these social and economic impacts would also occur with the Proposed Action and Alternative A; however, the impacts would occur 5 years sooner for the No Action Alternative.

Some workers would stay in the area, seeking employment, while others would relocate. The population would eventually decline and the demand for housing would decrease accordingly. Since boom-and-bust cycles have been a part of the social history of the area, the community would eventually adjust to the loss of population and economic benefits derived from the Denton-Rawhide Mine.

POTENTIAL MITIGATION AND MONITORING MEASURES

No mitigation and monitoring measures have been identified for social and economic values.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

There would be no irreversible and irretrievable commitment of resources associated with socioeconomic resources.

RESIDUAL ADVERSE EFFECTS

No residual adverse effects on social and economic values would occur.

CUMULATIVE EFFECTS

INTRODUCTION

This section of the EIS summarizes cumulative environmental effects on resources in the Denton-Rawhide Mine area that could result from the Proposed Action. As stated in 40 CFR 1508.7, "...'cumulative impact' is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency [Federal or non-Federal] or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time..."

Cumulative effects address direct and indirect impacts of resources described earlier in this chapter. Direct and/or indirect impacts were not identified for paleontological resources and noise; therefore, these resources are not included in the cumulative effects analysis. Cumulative effects analysis does not consider mitigation which may be required by BLM or other agencies for individual actions.

The geographic area addressed in the cumulative effects analysis varies depending on the resource being discussed. The cumulative effects area is generally bounded on the north by the southern end of Rawhide Flats, on the west by the Koegel Hills, on the east by the southern end of the Sand Springs Range, and on the south by the northern end of the Gabbs Valley (herein referred to as "general cumulative effects area").

PAST AND PRESENT ACTIVITIES

Mining and livestock grazing continue to be dominant land uses in the cumulative effects area. Ranching activities include development of livestock water sources, fencing, and installation of windmills. Livestock grazing has been excluded from mining areas associated with the Denton-Rawhide Mine.

Mining activities in the area include exploration (road building, drilling, trenching, sampling), open-pit mining, waste rock disposal, heap leaching, ore processing, and reclamation. Historic mining activity in the project area is described in Chapter 2.

REASONABLY FORESEEABLE ACTIVITIES

Foreseeable activities in the cumulative effects area include mine development, mineral exploration, mine-land reclamation, and livestock grazing. These land uses are expected to continue into the future at varying levels of activity.

Mining Activities

Mining is expected to continue as a major land use activity in the Denton-Rawhide Mine area. The Regent Mine area, located approximately 1.5 miles northwest of the Denton-Rawhide Mine, has been extensively explored by KRMC over the past 6 months. Ore from this area has the potential for economic recovery of gold and silver and could be processed at the existing Denton-Rawhide facilities. Waste rock produced during development of the Regent ore body would likely be placed in waste rock disposal facilities located close to the Regent Mine.

It is unlikely that development and processing of ore generated from the Regent Mine would result in extension of the overall mine life for the Denton-Rawhide Mine. As described in Chapter 2, the projected life-of-mine for the Denton-Rawhide Mine is to year 2016, with mining ceasing in 2001. The period from 2001 to 2016 would consist of reclamation activities. This 15-year period would likely be more than adequate to mine and process ore from the Regent ore deposit. No change in numbers of employees would be anticipated for development of the Regent ore deposit; however, mining work force would be employed for more years than currently anticipated for the Denton-Rawhide Mine.

An estimated 200 acres of land would be disturbed by development of the Regent ore deposit. Land disturbance would include open pit mines, waste rock disposal facilities, exploration (drilling, trenching, road building, sampling), heap leach pads, and ore and soil stockpiles. No other major exploration or mine development activities have been identified within the cumulative effects area.

Livestock Grazing

Although livestock grazing will continue to be a major land use within the cumulative effects area, total permitted grazing use is expected to decrease.

CUMULATIVE EFFECTS ANALYSIS

Geology and Minerals

The cumulative effects area for geology and minerals includes the Denton-Rawhide Mine and the Regent Mine area. Because mining is a major land use activity in the project area, it is reasonable to assume that large-scale mining will continue and will result in creation of open pits, waste rock disposal facilities, and ore- processing facilities (heap leach pads, crushing facilities, solution ponds). Future exploration activities may delineate deeper ore zones or ore bodies in adjacent areas.

Topography of the area will likely continue to be modified as a result of mineral exploration and mine development activities. Continued mining may afford the opportunity to backfill mined-out portions of pits with waste rock from future mine operations. Such opportunities would be judged individually and would be based on accessibility and economics of waste rock haulage.

Air Resources

Mining activities in the general cumulative effects area generate both particulates and gaseous pollutants due to fugitive and point sources. Fugitive emission sources include drilling, blasting, loading, hauling, and dumping of waste rock and ore. Even though gaseous pollutants and fine particulates are transported long distances downwind, they become dispersed and eventually removed by settling or washout by precipitation. Because of the air pollutant control measures required as conditions of air quality operating permits, point source emissions are low compared to fugitive emissions. Point source emissions are also transported long distances downwind and eventually removed similar to fugitive emissions. Ambient air monitoring in the cumulative effects area has demonstrated air pollutant concentrations well within ambient air quality standards. No additional degradation of the existing air quality is anticipated within the general cumulative effects area.

Water Quantity and Quality

The cumulative effects area for water resources includes Hydrographic Area No. 122 (Gabbs Valley). The only direct effect identified for water quantity and quality is the withdrawal of groundwater from the Gabbs Valley supply wells for an additional 5 years for the Proposed Action. Groundwater drawdown from these wells is predicted to be minimal and would not have a cumulative effect on the few additional wells located in the Gabbs Valley.

Soil Resources

The cumulative effects area for soil resources is the watershed in which the Denton-Rawhide Mine is located (Gabbs Valley). Prior to 1981, approximately 4.5 acres within the watershed had been disturbed by mining-related activities. Since 1981, 1,005 acres have been disturbed by exploration and operations at the Denton-Rawhide Mine, and an additional 364 acres is proposed for disturbance. Of this total, approximately 200 acres would not be reclaimed (Murray Hill pit).

Cumulative impacts would be limited primarily to wind erosion (pulverization of soil could increase susceptibility to wind erosion). Water erosion would not be expected to be a problem due to the arid climate (less than 6 inches of annual precipitation), as well as post-mining slope reduction. Losses from erosion would decrease following reclamation and reestablishment of vegetative cover.

In general, soil in the cumulative effects area is of poor quality due to high coarse fragment (rock) content, low organic matter content, high pH (moderately to strongly alkaline), and low water-holding capacity.

Vegetation

Continued mining or industrial operations are likely to continue in the foreseeable future within the general cumulative effects area. With the exception of open pits, reclamation would reestablish vegetation on mined areas. Livestock grazing would likely continue and would be the main source of potential damage to vegetation. Effects on the regional vegetation resource as a result of cumulative activities are expected to be insignificant.

Wildlife and Fisheries Resources

Continued mine development (e.g., Regent Mine) in the Denton-Rawhide Mine area would not have significant cumulative effects on wildlife. Due to the lack of perennial surface water bodies in the general cumulative effects area, no impacts to fisheries are expected. Livestock grazing would continue in and around the project area, but would have insignificant impacts on wildlife.

Threatened, Endangered, Candidate, and BLM-Sensitive Species

Development of ore bodies (in the general cumulative effects area) could adversely affect BLM-sensitive bat species. It is not known if loss of bats and bat habitats at shafts and adits in adjacent areas would result in significant reductions in Nevada bat populations or threaten the viability within the state and region.

Range Resources (Livestock Grazing)

The Denton-Rawhide Mine is the primary foreseeable project that would affect range resources in the general cumulative effects area. Mine developments in the LaBeau Flat Allotment are expected to have minimal affect on AUMs and grazing preference.

Recreation

Cumulative effects on recreation in the region surrounding the Denton-Rawhide Mine could include increased hunting, camping, and OHV use by mine employees and their families.

Land Use and Access

The only cumulative effect on access and land use in the general cumulative effects area would be restrictions and safety hazards related to open pits that are not backfilled.

Visual Resources

Impacts on visual resources from future mining can be minimized, but not eliminated, through reclamation. While it may not be feasible to restore pit highwalls to original contours, it is possible to regrade earthen structures to reflect existing forms, lines, colors, and textures. Angular features can be rounded and sideslopes flattened through grading. Revegetation also would reduce long-term visual impacts.

Cultural Resources

Cumulative impacts to cultural resources could occur from foreseeable mine development in the cumulative effects area. These impacts include disturbance of sites from constructing and monitoring activities, vandalism of sites, and increased access to sites. Cultural resource inventories have not been completed for the foreseeable mine areas; therefore, potential impacts cannot be quantified.

Social and Economic Resources

Although some exploration activities are taking place in Mineral and Churchill counties, no mining developments are scheduled to come on-line at this time (Durbin 1996). Reasonably foreseeable mining activities nearby include the Regent ore body about 1.5 miles northwest of the Denton-Rawhide Mine and the Talapoosa Mine Project in

Lyon County about 7 miles west of Churchill County. It is anticipated that the local labor market (Carson City and Lyon County) could meet the employment demands of the Talapoosa Mine (BLM 1996b). Development of the Regent ore body would include processing of the ore at Denton-Rawhide Mine, but would not increase employment levels. It is possible that cumulative socioeconomic impacts may result from population influxes created by other mining developments in the area.

Fallon, recently recognized by Money Magazine as being one of "America's 50 hottest little boomtowns" (Topolnicki 1996), is a growing community with several construction jobs in progress. Relocation of the Top Gun naval flight training school to Fallon, the Naval Air Station, defense contractors, and casinos have contributed to Fallon's growth. Hawthorne, too, has gained national recognition because its job growth rate of 2.6 percent a year is more than twice the national average of 1 percent (Mineral County Independent-News 1996b). Local economic development offices view this type of recognition as helpful in maintaining and attracting new investors who may provide new jobs. There is no indication that the local infrastructure and housing market would not be able meet the demands associated with the projected growth of the area.

CHAPTER 5

CONSULTATION, COORDINATION, AND PREPARATION

PUBLIC PARTICIPATION SUMMARY

INTRODUCTION

Public participation specific to the Rawhide Project is summarized in this chapter. The summary indicates means of public involvement, identifies persons and organizations to be contacted for comments and feedback, and specifies time frames for accomplishing goals in accordance with 40 CFR 1506.6.

Public involvement in the EIS process includes the necessary steps to identify and deal with public concerns and needs. The public involvement process assists in: (1) broadening the information base for decision making; (2) informing the public of the proposal and long-term impacts resulting from the action; and (3) ensuring that public needs and desires are understood by BLM.

Opportunities for participation and public notices are required at four specific points in the EIS process: the scoping period, review of the Draft EIS, review of the Final EIS, and receipt of the Record of Decision.

- **Scoping:** The public is provided a 30-day scoping period to identify potential issues associated with the Proposed Action that might warrant analysis during development of the Draft EIS.

- **Draft EIS Review:** The 60-day Draft EIS review is initiated by publication of a Notice of Availability for the Draft EIS in the Federal Register. During the review period, public hearings will be held in Carson City, Nevada, to obtain comments.

- **Final EIS Review:** The 30-day Final EIS review is initiated by publication of a Notice of Availability for the Final EIS in the Federal Register.

- **Record of Decision:** Subsequent to the 30-day review of the Final EIS, the Record of Decision will be prepared and a Notice of Availability for the Record of Decision will be published in the Federal Register.

IMPLEMENTATION

The six items listed below outline the necessary components used to implement the public participation process.

1. Public Scoping Period and Meetings

Publication of a Notice of Intent (NOI) initiated the scoping period on Wednesday, January 24, 1996. (Fed. Reg. page 1943). The NOI summarized the Proposed Action and the determination by the BLM that an EIS was necessary for analysis of the proposal. All appropriate news media and the public were notified of the periods available for comment. Twenty-four news organizations were contacted in Nevada.

Briefings on the proposed mine expansion project were given to the Churchill and Mineral County Commissioners. Thirty-seven scoping letters were sent to various agencies, groups, and individuals.

A public scoping meeting was held in Carson City, Nevada on February 15, 1996. The scoping meeting was attended by 1 person; no oral comments were received during the meeting. Scoping comments were accepted until March 1, 1996. During that period, BLM received written comments from 5 individuals and groups.

2. Public Scoping Report

BLM compiled a Public Scoping Report for distribution to interested persons. Upon written request, the Public Scoping Report can be obtained from the Carson City District BLM.

3. EIS Mailing List

An EIS mailing list of interested persons was assembled from previous mining-related EIS mailing lists and is included at the end of this chapter. This list was supplemented during the scoping process and is continuously updated as needed throughout the EIS process.

4. Distribution of the Draft EIS

The Draft EIS will be distributed as follows:

- A Notice of Availability will be published in the Federal Register specifying the dates for the comment period and the dates, times, and locations of public hearings.
- A news release will be provided by the Carson City District BLM at the beginning of the 60-day comment period. The news release will be submitted to all relevant news outlets.
- The Draft EIS will be distributed to interested parties identified on the updated EIS mailing list.
- Letters received from interested parties concerning the Draft EIS will be promptly acknowledged so respondents will know their comments have been received by BLM.
- A public meeting will be held in Carson City to obtain comments on the Draft EIS. The meetings will take place after publication of the Federal Register Notice. The meeting will be noticed in local newspapers and through news organizations.
- Briefings will be offered for local and state government representatives and Congressional Representatives as requested.

5. The Final EIS Distribution

The Final EIS will be completed considering comments from the review of the Draft EIS and released as follows:

- A Notice of Availability will be published in the Federal Register.
- Copies of the final document will be sent to those on the updated mailing list.

- A news release will be issued to all relevant news outlets through the Carson City District BLM office.

6. Record of Decision

The Record of Decision will be distributed to people and organizations on the updated mailing list, and a Notice of Availability will be published in the Federal Register. A news release will be issued to all relevant news outlets to announce distribution of the Record of Decision.

CRITERIA AND METHODS BY WHICH PUBLIC INPUT IS EVALUATED

Letters and testimony concerning the Draft EIS will be reviewed and evaluated by BLM to determine if information is presented that requires a formal response or contains new data to be brought to the attention of the BLM which identifies deficiencies in the Draft EIS. Steps would then be initiated to correct such deficiencies and to incorporate the information into the Final EIS.

Should changes from the Draft EIS to the Final EIS be deemed significant, BLM will review the need to reissue a Draft EIS, prepare a supplemental EIS, or to prepare a Final EIS.

CONSULTATION WITH OTHERS

The following state and federal agencies were consulted during preparation of the EIS:

- Nevada Department of Conservation and Natural Resources
    - Division of Environmental Protection
    - Division of Water Resources
- Nevada Department of Human Services
- Nevada Division of Wildlife
- State Historic Preservation Office
- U.S. Army Corps of Engineers
- U.S. Environmental Protection Agency, Region IX
- U.S. Fish and Wildlife Service.

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CHAPTER 6

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LIST OF ACRONYMS

AGP	acid-generating potential
AIRFA	American Indian Religious Freedom Act
AMSL	above mean sea level
ANP	acid-neutralizing potential
ARD	acid rock drainage
ATSF	Atchison, Topeka, and Santa Fe Railway
AUM	animal unit month
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
CFR	Code of Federal Regulations
cfs	cubic feet per second
CWA	Clean Water Act
DOT	U.S. Department of Transportation
EIS	Environmental Impact Statement
gpm	gallons per minute
HDPE	high-density polyethylene
HCN	hydrogen cyanide
kV	kilovolt
KOP	key observation point
KRMC	Kennecott Rawhide Mining Company
$\mu g/m^3$	micrograms per cubic meter
mg/l	milligrams per liter
mgpd	million gallons per day
MSHA	Mine Safety and Health Administration
MSL	mean sea level
NAAQS	national ambient air quality standards
NAC	Nevada Administrative Code
NAES	Nevada Agricultural Experiment Station
NAGPRA	Native American Graves Protection and Repatriation Act
NANP	Net Acid Neutralization Potential
NDCNR	Nevada Department of Conservation and Natural Resources
NDEP	Nevada Division of Environmental Protection
NDH	Nevada Division of Health
NDOT	Nevada Department of Transportation
NDOW	Nevada Division of Wildlife
NDWR	Nevada Division of Water Resources
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollution Discharge Elimination System
NRHP	National Register of Historic Places
NRS	Nevada Revised Statutes
OHV	off highway vehicle use
OSHA	Occupational Safety and Health Administration
PLS	pure live seed
POO	plan of operations
ppm	parts per million
PSD	prevention of significant deterioration
PVC	polyvinylchloride
R	range
RA	resource area
RCRA	Resource Conservation and Recovery Act
RDPC	Reclaimed Disturbed Plant Community
RMP	resource management plan
ROM	run-of-mine
SARA	Superfund Amendments and Reauthorization Act

SCS	Soil Conservation Service
SHPO	State Historic Preservation Office
SPPC	Sierra Pacific Power Company
SRA	state recreation area
SRMA	special recreational management area
T	township
TPQ	threshold planning quantity
TSP	total suspended particulate
USC	United States Code
USCOE	United States Corps of Engineers
USDA	United States Department of Agriculture
USDI	United States Department of the Interior
USEPA	United States Environmental Protection Agency
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geologic Survey
VRM	visual resource management
WAD	weak acid dissociable
WSA	wilderness study area

GLOSSARY

Alluvial. Pertaining to material or processes associated with transportation or deposition of soil and rock by flowing water (e.g., streams and rivers).

Alluvium. Soil and rock deposited by flowing water (e.g., streams and rivers); consists of unconsolidated deposits of sediment, such as silt, sand, and gravel.

Ambient. Surrounding, existing.

Baghouse. Dust collection and control facility.

Basic Elements (visual). The four major elements (form, line, color, and texture) which determine how the character of a landscape is perceived.

Bio-oxidation. Process by which chemicals are transformed into their oxidized state by living organisms.

Carbonaceous Ore. Ore containing large amounts of carbon.

Contrast (visual). The effect of a striking difference in form, line, color, or texture of the landscape features within the area being viewed.

Critical (Crucial) Habitat. Habitat that is present in minimum amounts and is a determining factor for population maintenance and growth.

dBA. The sound pressure levels in decibels measured with a frequency weighing network corresponding to the A-scale on a standard sound level meter. The A-scale tends to suppress lower frequencies (e.g., below 1,000 Hz).

Decibel (dB). One-tenth of a Bel is a measure on a logarithmic scale which indicates the ratio between two sound powers. A ratio of 2 in power corresponds to a difference of 3 decibels between two sounds. The decibel is the basic unit of sound measure.

Disturbed Area. Area where natural vegetation and soils have been removed.

Doré Bars. Product of retort furnace containing gold, silver, and impurities.

Endangered Species. Species in danger of extinction throughout all or a significant portion of its range.

Ephemeral Stream. A stream or portion of a stream which flows briefly in direct response to precipitation in the immediate vicinity, and whose channel is at all times above the water table.

Evapotranspiration (ET). The portion of precipitation returned to the air through evaporation and transpiration.

Feeder Zones. Deep pathways followed by mineralizing fluids to form an orebody, often containing rich ore.

Floodplain. The low and relatively flat areas adjacent to rivers and streams. A 100-year floodplain is that area subject to a 1 percent or greater chance of flooding in any given year.

Forage. Vegetation used for food by wildlife, particularly big game wildlife and domestic livestock.

Game Species. Animals commonly hunted for food or sport.

Grousering. Mechanical shaping of land used to create micro-habitats for revegetation.

Hertz (Hz). The unit of frequency (i.e., sound) formerly designated as cps - cycles per second.

Host Rock. A rock body or wall rock enclosing mineralization.

Hydraulic Gradient. For groundwater, the rate of change of total head per unit of distance of flow at a given point and in a given direction.

Hydrostratigraphic Unit. Grouping of stratified, mainly sedimentary rocks that have similar groundwater flow conditions.

Igneous. Rock or mineral that solidified from molten or partly molten material.

Intermittent Stream. Stream that flows only part of the time or during part of the year.

Key Observation Point (KOP). An observer position on a travel route used to determine visible area.

Lithic Scatter. A discrete grouping of flakes of stone created as a byproduct in the tool-making process. Often includes flakes used as tools as well as formal stone tools such as projectile points, knives, or scrapers.

Makeup Water. Water needed to supplement water removed by milling or processing of ore and losses to evaporation.

Maximum Credible Earthquake. The largest conceivable earthquake that could occur in an area.

Mesic. Moist habitats associated with springs, seeps, and riparian areas.

Mitigation. Actions to avoid, minimize, reduce, eliminate, replace, or rectify the impact of a management practice.

Peak Flow. The greatest flow attained during melting of winter snowpack or during a large precipitation event.

Perched Water Table. Unconfined groundwater separated from the underlying main body of groundwater by unsaturated rock.

Perennial Stream. A stream that flows throughout the year and from source to mouth.

Permeability. The capacity of porous rock, sediment, or soil to transmit a fluid.

pH. The negative $\log_{10}$ of the hydrogen ion activity in solution; measure of acidity or basicity of a solution.

PM-10. Particulate matter less than 10 microns in aerodynamic diameter.

Probable Maximum Precipitation (PMP). The greatest depth of precipitation for a given duration that is physically possible over a given storm area at a particular location at a certain time of year.

Raptor. A bird of prey (e.g., eagles, hawks, falcons, and owls).

Refractory Ore. Ore difficult to treat for recovery of valuable substances.

Retort. A furnace in which ore may be heated for removal of its metal content.

Riparian. Situated on or pertaining to the bank of a river, stream, or other body of water. Riparian is normally used to refer to plants of all types that grow along streams, rivers, or at spring and seep sites.

Run-of-Mine Ore. Ore taken from a mine or pit directly to a mill or leach pad for processing.

Scoping. Procedures by which agencies determine the extent of analysis necessary for a proposed action, (i.e., the range of actions, alternatives, and impacts to be addressed; identification of significant issues related to a proposed action; and the depth of environmental analysis, data, and task assignments needed).

Sediment Load. The amount of sediment (sand, silt, and fine particles) carried by a stream or river.

Significant. As used in NEPA, requires consideration of both context and intensity. Context means that the significance of an action must be analyzed in several contexts such as society as a whole, and the affected region, interests, and locality. Intensity refers to the severity of impacts (40 CFR 1508.27)

Sulfides. That part of a lode or vein not yet oxidized by air or surface water and containing sulfide minerals.

Tackifier. An agent that binds seed, fertilizer, and mulch to a site, often used when seeding slopes.

Threatened Species. Any species of plant or animal which is likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

Total Suspended Particulates (TSP). Particulates less than 100 microns in diameter (Stokes equivalent diameter).

Total Dissolved Solids (TDS). Total amount of dissolved material, organic or inorganic, contained in a sample of water.

Total Suspended Solids (TSS). Undissolved particles suspended in liquid.

Weak Acid Dissociable (WAD). Compound that in the presence of a weak acid would disassociate into its ionic forms in solution.

Wetlands. Areas inundated by surface water or groundwater with a frequency sufficient to support vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction.

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